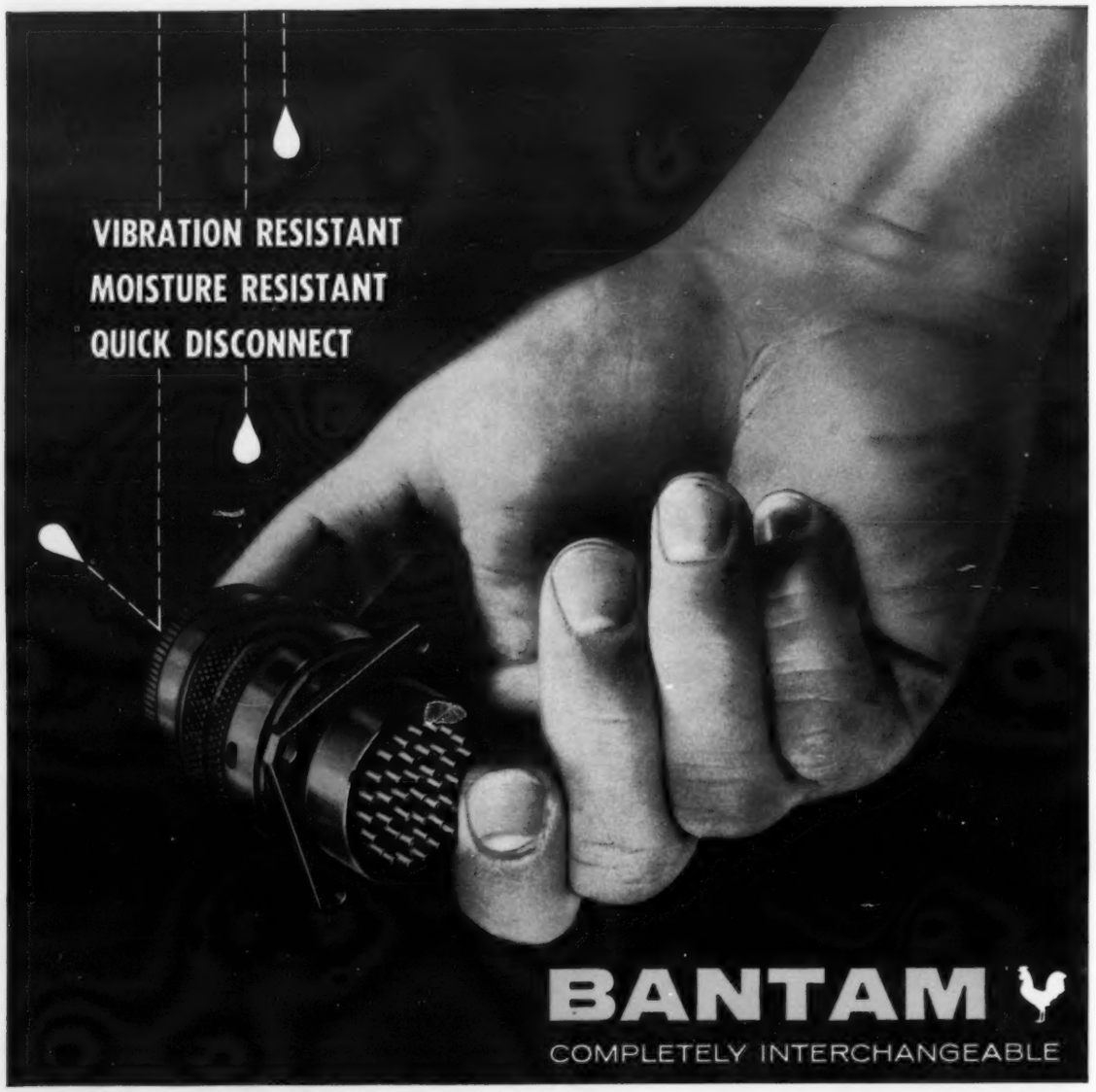
Design News



Molded bosses locate, support gears in small 'Delrin' pump. Page 86

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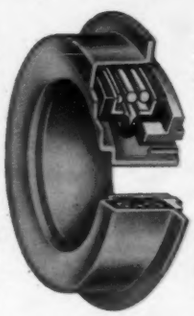


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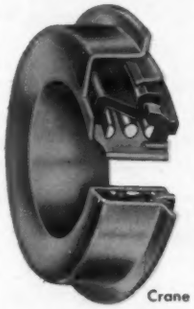
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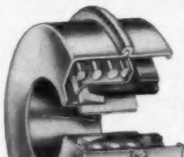
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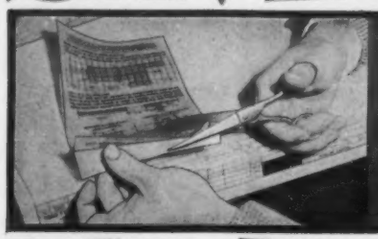
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SOUNDING BOARD

FOR OUR READERS



Wet Bullets Wield Wallop

In the August 4 issue of DESIGN NEWS I noticed "Wet Bullets Wield Wallop" in Plans and Cross Sections. The 1,000,000-sec bursts of light could have been emitted when the shock from impact reflects back through the collapsing drop of water, raising the electrons in the hydrogen and oxygen molecules to an excited state. When the electrons returned to their normal level, light of the hydrogen and oxygen spectra would be given off. Balmer's formula expresses the emission frequency of the elements: $v = RZ^2 (1/2 - 1/k)$, where R = Rydberg constant; v = wavelength; Z = atomic number, and k = integer greater than 2.

P. A. ARMSTRONG
1249 Stratford Rd.
Deerfield, Ill.

Memo to All Engineers

I am sure that most readers will echo the point you made in your "Memo Addressed to All Engineers" (DESIGN NEWS, July 21) on the necessity for producing good technical literature. . . .

The typical engineer does not make the best technical writer, despite the valuable assets he possesses in training and practice at his craft. . . . To be successful in the technical writing field, a man must possess, among other things:

1. A sound basic knowledge of the branch of engineering in which he works (e.g., hydraulic, electronic, electromechanical, etc.).
2. First-class knowledge of the language in which he writes. Possession of a degree does not automatically confer this.
3. A flair for detection. It is surprising how often a technical writer has to emulate Sherlock Holmes in digging out vital facts from a welter of unimportant things.
4. The patience of Job.
5. Extreme versatility and adaptability.
6. The ability to assimilate an enormous amount of theory and technical explanation, then to sort and sift it until he is left with the bare bones. . .
7. A sixth sense which tells him when an engineer knows what he is talking about and when he does not . . . A writer who has this sense can obviate a disastrous faux pas by checking and rechecking his information until he himself is convinced. One who lacks it will eventually meet his Nemesis, although not perhaps before incorrect and misleading information has been published.

The competent technical writer is not a man who has failed, nor is he a rival to the engineer. He, too, is a dedicated man, who has a vital place to fill in the field of industry and scientific progress.

FRANK BRYANT
Rockford, Ill.

Decline and Fall

On the eve of our nation's 185th birthday I cannot refrain from writing you to commend you on your very fine editorial in the June 19 issue. Certainly you have gone to the root of much of our nation's trouble. I agree with you 100 percent and I hope other publications will follow your lead. It is really later than we think and we Americans, if we hope to remain a great nation, must correct our morals.

Your editorial is so well-written and so appropriate to the times that I am requesting permission to send copies of it to various newspapers and to "Life Lines"—a nationwide organization devoted to the preservation of our American way of life. I hope you will see fit to grant such permission. Meanwhile, keep up the good work and we enjoy your publication very much.

ROBERT M. GOOCH
Lewisburg, Tenn.

• **Permission granted.**

So Johnny Can't Write . . .

I was extremely interested in your editorial discussion entitled "So Johnny Can't Write . . ." in the July issue of DESIGN NEWS. The primary reason for my interest is that during my college days, I was fortunate to have an English professor with a strong belief that engineers were bums. This professor (incidentally, *she* was a Ph.D.) apparently came to this conclusion because none of the engineers she knew could assemble a good speech or a well-written paper—even as a group. My 11 years of experience in the engineering field has been saturated with a strong desire to prove that she was wrong. . . .

I have included a copy of your editorial with some notes I made as I read it. I do this sort of thing from time to time just to emphasize to myself how difficult it is to write clearly and correctly at the same time. As an editor, you can probably do the same thing to this letter. We do agree, however, that science and engineering have one major common problem—communications. I sincerely hope that people like you will continue to hammer at the importance of solving this problem. Otherwise we may find ourselves hopelessly lost in a tangle of misstated and misunderstood information.

W. J. LUX
Supervising Engineer
Basic Engines, Res.
Caterpillar Tractor Co.
Peoria, Ill.

War in Materials

In Gilbert and Sullivan's "Mikado" there is a song that mentions something about letting the punishment fit the crime. This sounds like a wise bit of basic justice and represents a thought with which I have no quarrel.

We have all seen many poor applications of materials. This has been the subject of a number of editorials on these pages. Entire industries have received black eyes from which they never recovered because of this simple but often overlooked factor. The crime: Wrong choice of material. The punishment: Temporary and sometimes permanent oblivion for a product. Surely this is poetic justice.

The trouble with this kind of thinking is that sometimes not only the product is harmed, but also an entire industry. It is unfortunately true that the field of plastics, for instance, still has not recovered from the effects on the public of poor engineering and wrongful plastics applications during the early days of the industry.

Judging from the number of advertisements appearing in the trade press of late, a war is brewing between the suppliers of three basic materials. These are steel, aluminum and plastics. While I firmly believe in competition as a cause of progress, I am equally certain that war never gains anything for those concerned. By definition war is a waste.

Chances are we will see many new products using the wrong materials. Designers may be told to use materials because of price alone. Or they may be told they should use a material mostly because of its appearance.

It is up to the engineer to resist this kind of thinking. It is up to the engineer to investigate all the factors involved in choosing the right material for an application. More, it is up to him to sell the entire concept to management even if it means rejecting a "pretty" or "low-cost" material.

It is with this in mind that we have "engineered" the next issue of DESIGN NEWS with particular emphasis on materials. We hope the special emphasis in the September 29 issue will help shed some light on the need for better engineering with materials.

J. F. Dubois

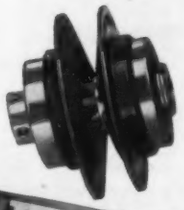
Executive Editor

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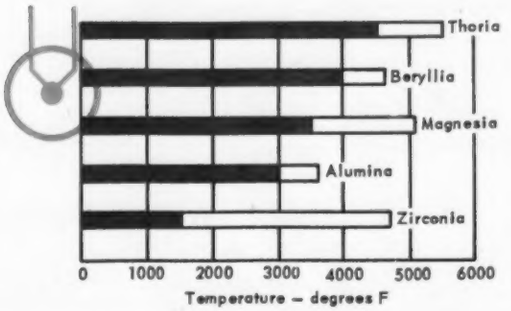
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DESIGN SPECIAL REPORT NEWS

Thermocouples and Their Applications

Paul R. Taylor, Associate Editor



Thermocouples are made of two dissimilar metals which, when heated, generate a small d-c voltage. The thermoelectric electromotive force generated in a thermocouple circuit is measured to give the temperature of the other junction, making a convenient and simple thermometer.

Basic Thermocouple Materials

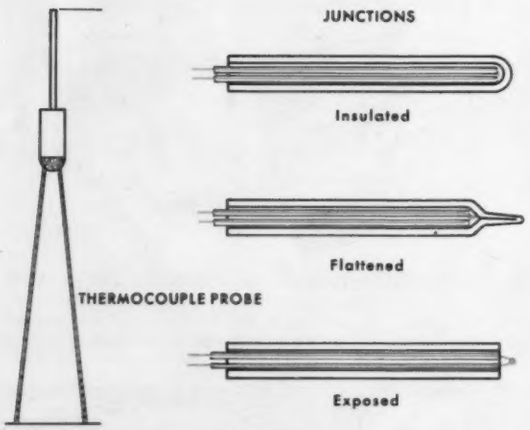
All thermocouples are comprised of four basic components: sheaths, insulators, thermo-elements and connectors or terminations.

Thermo-elements: Platinum, pure and alloyed with rhodium;
Iridium, pure and alloyed with rhodium;
Tungsten, pure and alloyed with rhenium;
Rhenium.

Insulator: Alumina (Al_2O_3);
Magnesia (MgO);
Beryllia (BeO).

Sheath Materials: Platinum;
Tantalum;
Molybdenum;
Molybdenum with CR coating for oxidation resistance.

Terminations: Quick-disconnect;
Ceramic;
Industrial;
Matching lead wires;
Copper lead wire, with secondary thermo-element for compensation.



SMALLEST INSULATED electrically fused wire thermocouples are the result of extreme miniaturization of standard components, decreasing response time and increasing accuracy that can be obtained with commercially available thermocouple materials. Insulators have a voltage breakdown through 0.0005-inch wall of over 10,000v and electrical resistivity is better than 7 x 10^7 ohm-centimeters at 1000C. Baldwin-Lima-Hamilton, Waltham, Mass.

Materials listed are limited in elevated temperature atmosphere to which they may be subjected. All materials may be used in inert or vacuum conditions.

Since thermocouples can be made small and with very short time constants, there is to serious problem with interchangeability among thermocouples of the same type. With suitable care, thermocouples of platinum versus platinum-rhodium are capable of high accuracy and are the preferred device for precision temperature measurements between 650

Fig. 1

SHEATH	INSULATION●	THERMO-ELEMENT★	ATMOSPHERE▲	MAX TEMP DEG F
Platinum	M	S	O, I, V	3050
	M	R	O, I, V	3050
Molybdenum with CR coating	V	S	O, R, I, V	3050
	V	R	O, R, I, V	3050
	G	V	O, R, I, V	3600
	G	Z	O, R, I, V	4000◆
Molybdenum	V	S	I, V, R	3050
	V	R	I, V, R	3050
	G	V	I, V, R	3600
	E	Z	I, V, R	4000◆
	E	AA	I, V, R	4000◆
Tantalum	A	S	I, V	3050
	A	R	I, V	3050
	M	V	I, V	3600
	B	Z	I, V	4000
	B	AA	I, V	4000

● Insulation Symbols: M or G – MgO – Magnesia (crushable or vitrified)
A or V – Al_2O_3 – Alumina (crushable or vitrified) B or E – BeO – Beryllia (crushable or vitrified)

★ Thermo-Element Symbols: V – Iridium – 60 pct rhodium/iridium R – Platinum – 13 pct rhodium/platinum
S – Platinum – 10 pct rhodium/platinum Z – Tungsten–rhenium AA – Tungsten – 26 pct rhenium

▲ Atmosphere Symbols: O – Oxidizing (more than 0.5 pct free oxygen) V – Vacuum (less than 10^{-4} inches Hga)
I – Inert (helium, argon, neon, etc) R – Reducing (less than 0.5 pct O_2)

◆ Intermittent in oxidizing atmosphere

and 1063C. Carefully installed thermocouples can be used as high as the melting point of platinum (1773.5C).

Thermocouple Effects and Laws

The basis of the thermocouple principle is the Seebeck effect discovered by Thomas Johann Seebeck in 1822 (the production of electromotive force as a result of a circuit containing two junctions between the materials at different temperatures).

If a simple loop circuit is formed of two different materials and one junction is at a higher temperature than the other, then an EMF (voltage) is produced in the circuit. The magnitude and direction of the EMF depends upon the materials and the temperature of the junctions. If one of the junctions remains at a fixed reference temperature, the EMF generated will be related to the temperature of the other junction and may be used as a measure of the temperature of the other junction.

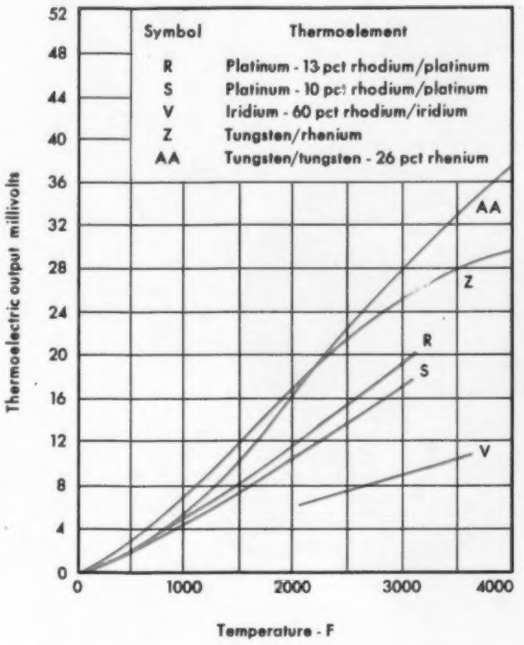
An additional law which is important for the understanding of thermocouple circuitry is the law of intermediate metals.

This law states that the insertion of an additional metal into a thermocouple circuit does not change the effective EMF, provided the junctions formed by this metal are at the same temperature.

This phenomenon makes it possible to insert galvanometers, millivoltmeters, potentiometers and other measuring instruments into thermocouple circuits with affecting the circuit being measured. This law also makes it possible to use one material as a reference for all materials.

Thermo-Elements

The thermo-element combinations noted in Fig. 1 are receiving considerable attention in the search for materials for high-temperature measurement. Notable in this is tungsten-rhenium, but its usage is restricted to reducing, inert or vacuum atmospheres. Platinum-rhodium/platinum can be used continuously in oxidizing atmospheres to temperatures slightly greater than 3000F. Above this temperature, iridium-rhodium/iridium is recommended.



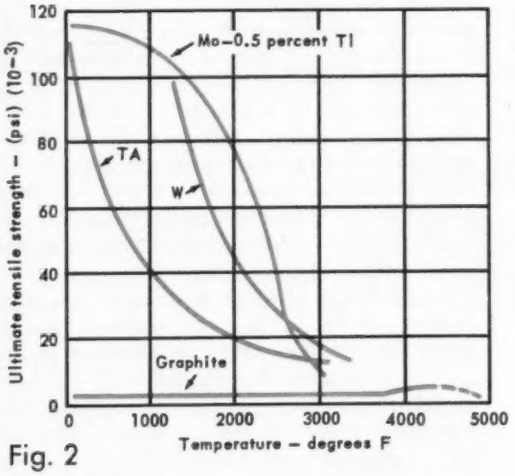


Fig. 2

Approximate degradation in ultimate tensile strength with temperature of various thermocouple sheath materials

Insulators

The function of the insulator is to provide electrical resistance between the wires and the sheath and between the wires themselves. However, the insulator should be a good thermal conductor.

The three insulators recommended are chosen for their respective dielectric and thermal conductivity characteristics. Vitrified alumina is a good insulator up to temperatures of approximately 3000F. Above this temperature, its dielectric characteristics are too low to be considered for use in thermocouples.

Magnesia is a better insulator than alumina at the higher temperatures, and possesses a higher thermal conductivity, permitting its usage to temperatures of 3600F. Beryllia exhibits approximately the same electrical properties as magnesia and has an extremely high coefficient of thermal conductivity. Beryllia is recommended for usage not exceeding 4000F, as above that temperature toxic gases are generated.

Sheaths and Oxidation-Resistant Coating

All the sheath materials are generally known, with perhaps the exception of molybdenum with CR coating. This coating is required on molybdenum when used in an oxidizing atmosphere, as molybdenum oxidizes extremely fast at elevated

(Continued on next page)

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Thermocouples . . . *Cont.*

MILITARY STANDARDS THERMOCOUPLE SYMBOLS



Temperature-measuring thermocouple



Integral heater, internally connected



Integral insulated heater

temperatures. The coating has the advantage of being extremely hard and will withstand thermal shock and most mechanical shocks. It will not peel or spall because of the bonding structure of the coating with the parent molybdenum. It is also chemically inert and will withstand almost all environments at high temperatures.

Sheath Materials

For structural rigidity, thermocouples can be encased in a material sufficiently strong to withstand service conditions of temperatures in combination with fluid flow and corrosive media. Fig. 2 represents a study of the comparative merits of sheath materials. It is seen that tungsten, tantalum and molybdenum (alloyed with 0.5 percent titanium), exhibit ultimate tensile strengths between 10,000 and 18,000 psi at 3000F. The alloy of 0.5 percent titanium with molybdenum was chosen in place of pure molybdenum, as it has better strength characteristics.

Another material which does not exhibit good strength properties at low temperatures but which has the characteristic of increasing tensile strength with increasing temperature is graphite. At 3000F, its tensile strength is approximately 3000 psi; at 4500F, its tensile strength is 4200 psi, which permits its use at very high temperatures. These materials are useful only in reducing, inert or vacuum atmospheres.

Applications

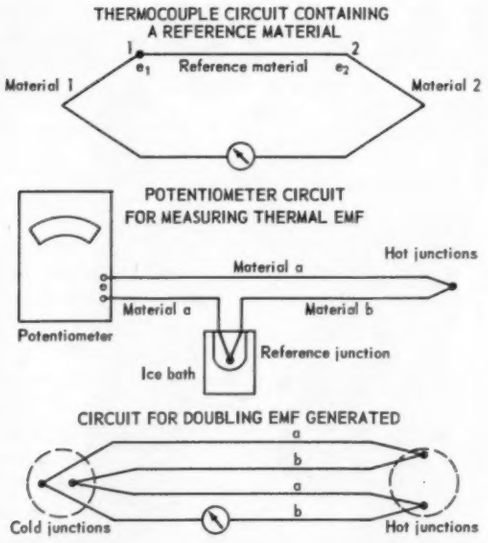
With the advance of materials research, thermocouples now can be used in many applications which heretofore have not been amenable to accurate or convenient temperature measurement. Some specific applications are:

Industrial: Measurement of molten glass;
Control of high-speed batch processes;
Measurement and control of ultrahigh-temperature furnaces.

Missile and aircraft: Measurement of temperature of rocket exhausts and other gas generators such as afterburners;
Measurement of nose cones entering atmosphere.

Nuclear: Measurement of coolant gas and fuel pin temperature (materials can be chosen for low neutron capture cross-section).

Laboratory: Measurement and control of temperature of pilot-process prototypes of full-scale processes;
Measurement and control of temperatures of crystal-growing ovens.



Information presented in this article was provided by Aero Research Instrument Co., Inc., Chicago, Ill.; Genistron, Inc., Los Angeles, Calif., and Baldwin-Lima-Hamilton, Waltham, Mass.



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Globe electronics was faced with a challenge . . . perhaps you have a similar one right now. They wanted their new, tiny 'Pocketphone' 2-way radio to have a modern case with eye appealing design and a rich lustrous finish. It had to be a thin walled material of high impact strength. Added to these was the important factor of cost.

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SEEN AND HEARD

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Edward W. Schrader, Western Editor

INDUSTRY . . .

is rediscovering the black box. Not the black box filled with transistors—but the empty black box with a lens on one side and a light-sensitive film on the opposite side.

After booming electronic instrumentation for years, engineers are coming full circle to recognize photographic instrumentation for some of its values.

Photography captures events. It is a memory device which permits the engineer to go back and study events at his own convenience. Furthermore, the engineer can fiddle with the dimensions of size and time when he uses such a memory.

These are the observations of Bernard S. Benson, part-time author and president of Benson-Lehner Corp.

Morton Sultanoff, a research physicist at Aberdeen Proving Grounds, points out that photography is considered an art—not a technology. The Brownie has made everyone a photographer. Yet, hypervelocity flight and shock waves were investigated by Mach with photographic instrumentation.

Until recently, lens design has been limited because of the burden of computations when tracing the rays of light through a complex lens system. Electronic data processing opens a new generation in lens design.

On the chemical side, film makers have improved emulsions, increasing speed and resolution.

Photo instrumentation is commonly overlooked as a technique for design analysis and problem solving. There is no civil service classification for a photo instrumentation engineer; therefore, there is a small inventory of personnel and equipment.

Mr. Sultanoff notes that more firms are entering the field of photographic instrumentation. Even so, he points out that Russian photo instrumentation is the equal or superior of any that we have. As an example, he describes a Russian high-speed camera capable of taking a total of 1500 pictures at the rate of 200,000 frames per sec. A U.S. firm manufactures a faster camera which can be slowed down to this rate, but fewer pictures are obtained.

The known need for such a camera is too limited for an American firm to invest funds in research and development. We could copy the Russian design, but we are above that approach!

As a further comparison to Russian design, Mr. Sultanoff comments that they keep the design simple. We spend too much effort, money and time in engineering the product for appeal, acceptance and sales.



ON ENGINEERING COMPETENCE . . .

Mr. Benson indulges in some introspection:

We confuse stupidity with brilliance. If a design flops four times and the fifth approach is successful, we call it research and development. In reality, it is incompetence.

We lack direction. We follow the Soviets as a leader and this futility is compounded in Washington by empire building. Original and aggressive thinking seems to be nonexistent.

Industry compensates engineers for instability rather than ability. An engineer has only to change jobs to advance and to increase his income. He is paid more for achieving less—he is paid for instability.

Two things motivate an engineer.

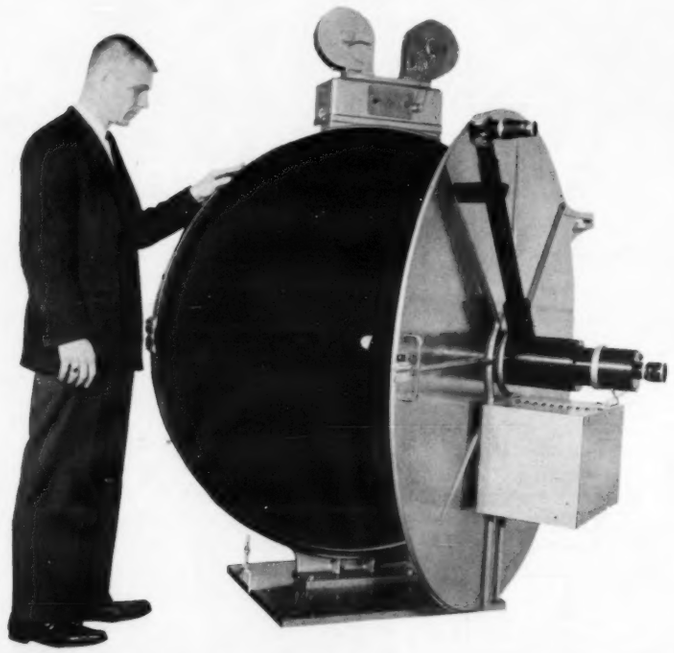
1. Fears of starving.
2. Pride.

Fear of starving cannot improve engineering, since the engineer can change jobs and increase his salary.

The psychologists remove pride as a motivation. The social scientists declare that when a man fails he should be patted on the back and encouraged to try again, thus giving him acclaim and salvaging his pride.

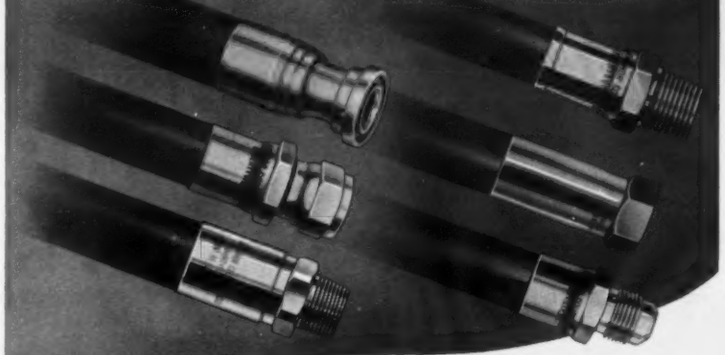
Mr. Benson observes that social adjustment creates weakness and does not urge men to perform at their highest level. He feels that management must create an environment to gain admirers for success, but not with jealousy, and to create scorn for failures.

Management should forget about the emotional needs of men and fire the failures.



ULTRASPEED CAMERA, manufactured by Benson-Lehner, has film box shaped like large disc, with feed and take-up magazines at top. Tubular lens and shutter assemblies mount at front end of disc's center axis. High-speed air turbine rotates mirror located at rear end. Electronically controlled flash lamp illuminates specimen. When electronically controlled shutter is open, light enters film box and strikes single revolving mirror which carries image to film. Framing rate is variable from 500 to 1,600,000 pictures per sec, dependent on mirror speed and frame size. At 400,000 pictures per sec rate, camera exposes 240 full-frame, 35-mm pictures.

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Explosive Expansion of Air by Spark Heat Punches Moving Paper

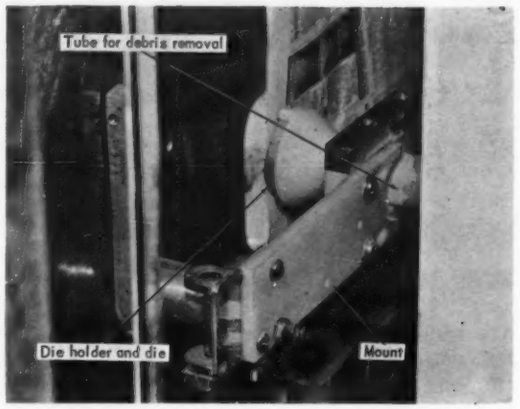
E. J. Stefanides, Central States Editor

Paper moving at high speed past a controlled spark gap is punched by the explosive thermal expansion of air in the spark gap. A high-current spark moving in a controlled channel of restricted cross-section produces a very high transient gas pressure caused by the thermal expansion of the confined gas that is heated to extreme temperature by the discharge.

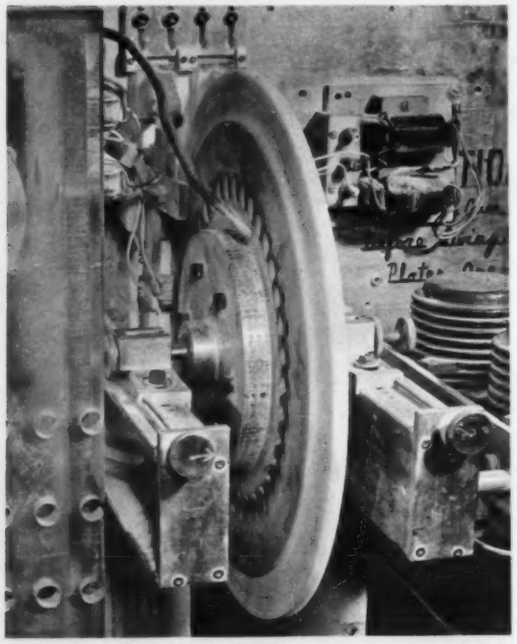
Mechanical motion produced by this "exploding spark" occurs within microseconds after the triggering electrical signal is given. The rate of response is much faster and more precisely controllable than that ordinarily obtainable from relays and servo-controls which utilize electromagnetic forces. The speed of the punching action is such that, for practical purposes, linear velocity of the paper past the gap is not a factor.

In this application, 1/4-inch-dia, accurately spaced ring binder holes are put into paper moving through a press at 20 fps. This supersedes a previously employed stack and drill process.

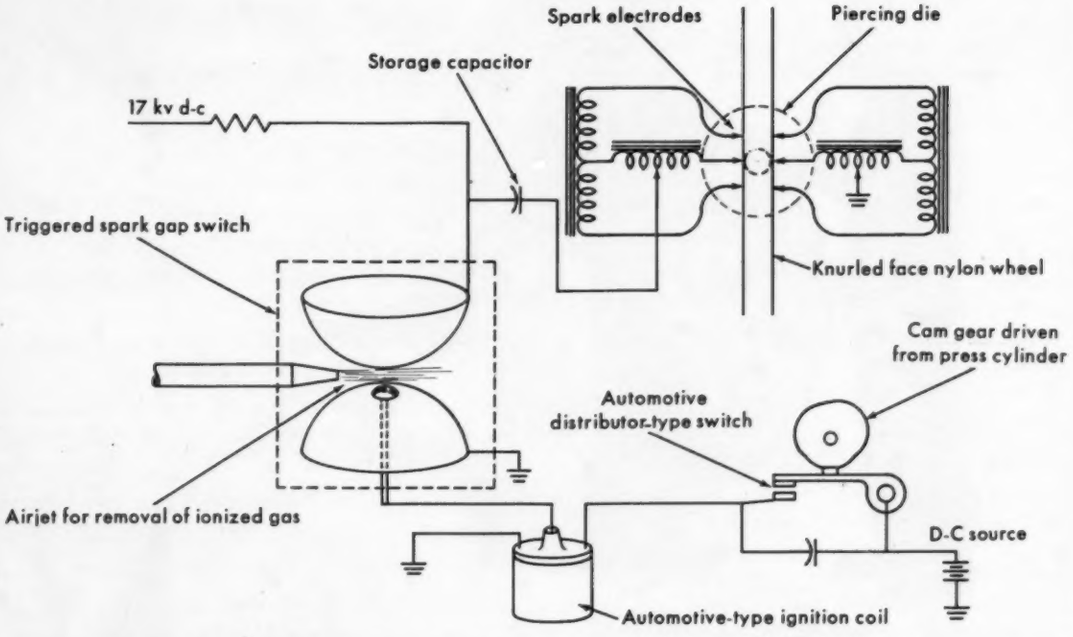
The high-speed, spark-discharge paper-punch application was developed by Harold C. Early of the University of Michigan Research Institute for the Meredith Publishing Co., Des Moines, Iowa.



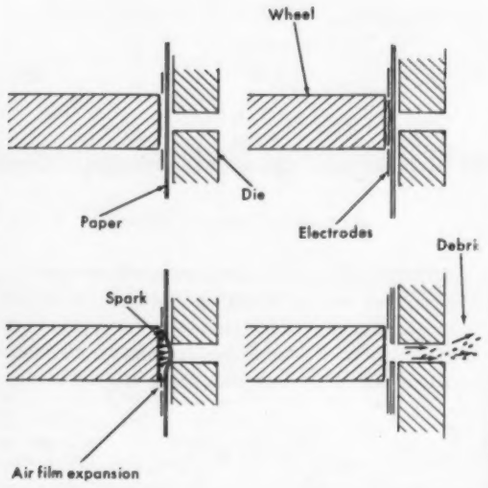
CERAMIC DIE against face of paper opposite spark. Nylon support arm holds die in place and avoids shorting of spark. Debris in form of small flakes and vapor is carried away from punch mount by tube.

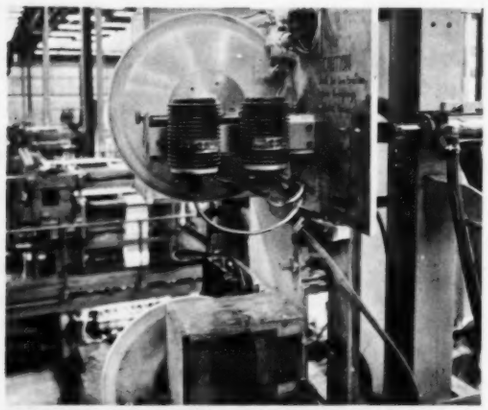


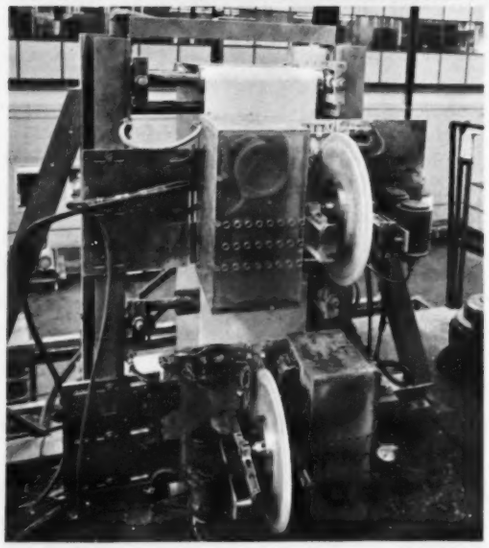
AIR BLAST causes wheel to rotate with rim speed approximately equal to speed of paper. This avoids smearing of print by friction between wheel and paper. Micrometer lead screws position wheel relative to paper. Dielectric block, adjacent to wheel edge and paper face, mounts electrode. Wheel is trued and knurled each day.



SPARK-CAP SWITCH causes spark punch to fire. Spark current flows through three parallel spark channels among triple electrodes. Channels are equalized by balancing reactors which control hole quality. Energy source is 0.01-mf capacitor charged through resistance from 17-kv d-c source. Trigger action is by cam on print roller operating automotive-type distributor points and ignition system. Operation of points causes spark to be generated on one side of spark gap switch by coil. Spark ionizes air in switch gap, making it conductive. This closes switch, causing storage capacitor to discharge, producing spark for punching paper. Air jet in switch gap removes ionized air, speeding up dielectric recovery for recycle. Thyratron tube could be used for this purpose.



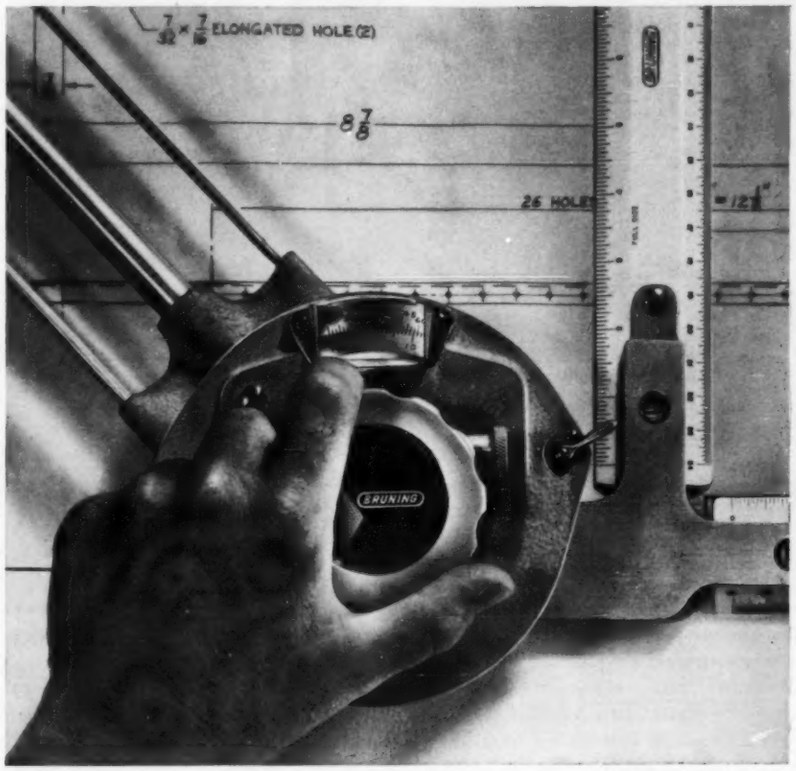




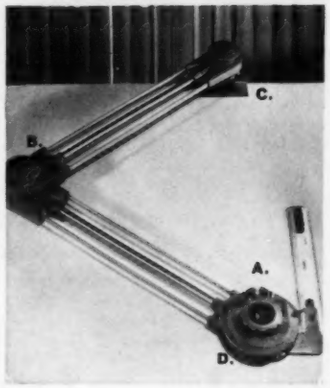
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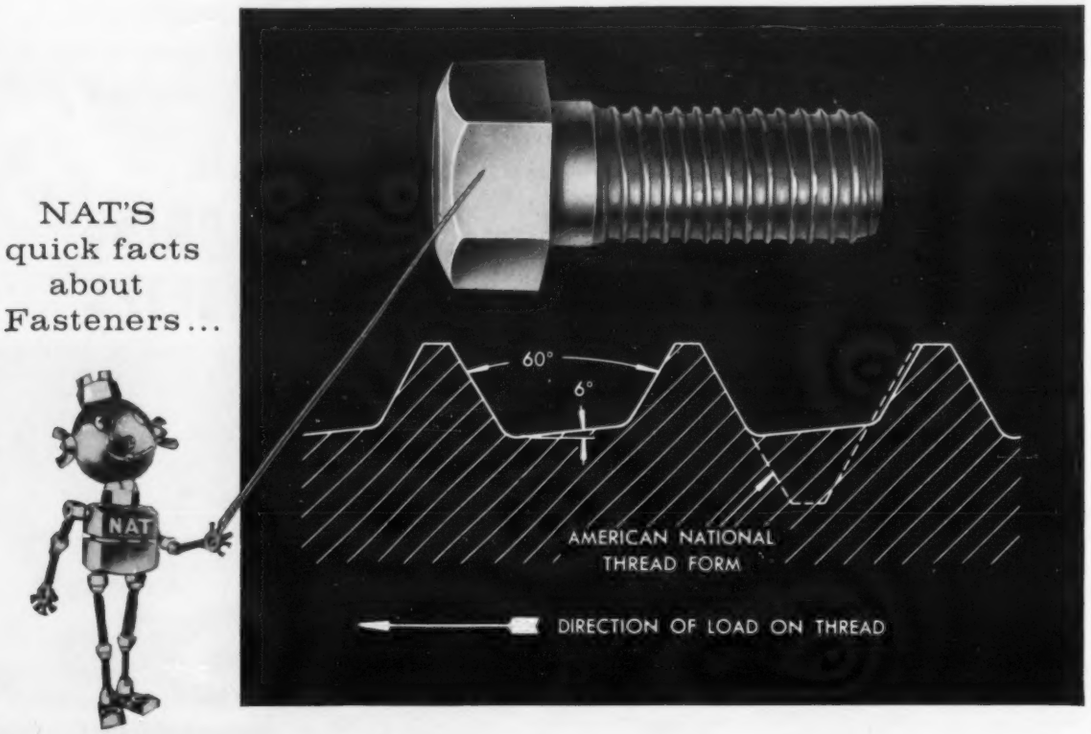
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Rotating Optical System

R. F. Stengel, German Editor

A motor-driven system automatically scans the entire surface of ball-bearing spheres; reflected light is interpreted by an electronic evaluation unit which rejects defective specimens. Previous methods relied on time-consuming manual inspection.

The stationary unit of the optical system holds the sensitive light source and reflected light multiplier. The rotating unit contains only mirrors and a simple lens. Driven at up to 60,000 rpm by an intermediate-frequency motor, it runs on aerodynamic bearings which require no lubrication or maintenance.

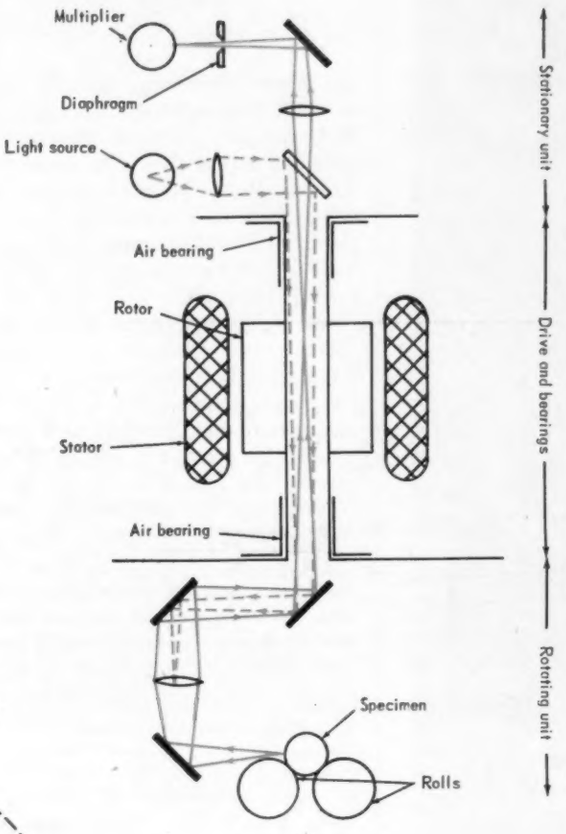
To scan a spherical surface, mirrors rotate around the sphere. If the sphere were stationary, the narrow light beam only would scan a narrow meridional belt. Two motor-driven horizontal rolls therefore turn the sphere slowly around an axis normal to that of a mirror unit so that the meridional scanning belts gradually cover the entire surface. An overlap of at least 17 percent between successive passes is assured; with the rotating unit spinning at 30,000 rpm, an 8-mm dia sphere is completely scanned in 0.1 sec.

The optical system relies on tight beams and a diaphragm to insure that only directly reflected light returns to the stationary unit. At any defective spot (such as porosity, lap, grinding scratch and rust) the scanning beam is reflected more diffusely, causing a sudden drop in the light-intensity level.

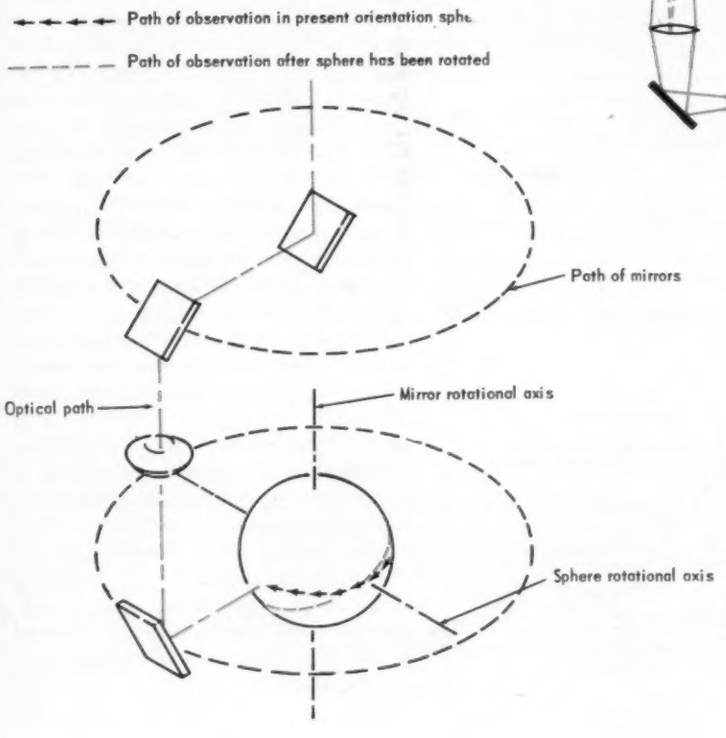
The discrepancy is amplified in an RCA 931 A multiplier, checked by an amplitude discriminator for magnitude and stored in a bistable multivibrator. When scanning is completed, the stored defect information inductively causes a pulse which triggers an electromagnetic sorting gage and rejects the specimen.

The rotating optical sphere scanner was developed by H. Schier, Ph.D., in the laboratories of Kugelfischer Georg Schaefer & Co., Schweinfurt, Germany.

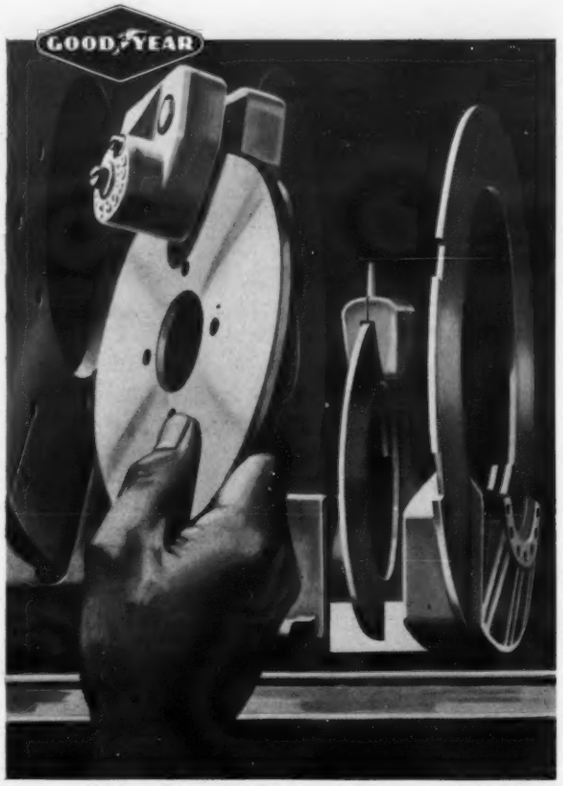
Automates Surface Inspection of Spheres



OPTICAL PATHS are shown schematically. Outgoing light (broken line) from source passes through condenser, is reflected by stationary semitransparent mirror through hollow root into rotating unit. Mirror-and-lens combination focuses beam on sphere which simultaneously is turned by horizontal rolls around axis normal to that of rotating mirrors. Reflected beam (solid lines) returns by way of same optical elements, passes through semitransparent mirror, is trimmed further by diaphragm and enters multiplier.



SCANNING GEOMETRY is illustrated by simplified sketch. Sphere is turned by rolls around horizontal axis, while rotating mirror system turns around vertical axis. Both axes intersect in center of sphere. For sphere held stationary, observation point would follow track indicated by solid arrows. If rolls turn sphere through angle α resulting scanning path is shown by broken line. In actual device, sphere is turned continuously while rotating mirror system spins and light beam scans surface completely.



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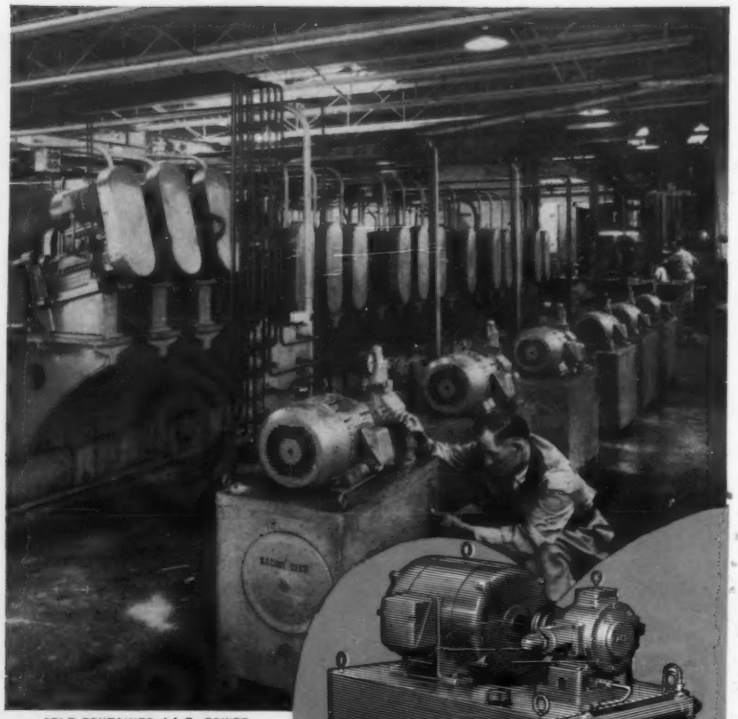
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Six hydraulic hearts

FURNISH MUSCLE FOR 5 TRANSFER OPERATIONS . . . WITHOUT A PALLET

"This is the first time that a spider for a universal joint has been machined in direct transfer of the part itself rather than by pallet transfer," says William Defibaugh, Vice President and Chief Engineer of Drillunit, Inc. The new unit is only half the size of any previous spider transfer machine. Clamping and unclamping the spider are governed by 5 RACINE Model 4FA Pumps, each one a self-contained power unit with its own reservoir. A sixth 4FA unit controls movements which turn, probe and transfer the part from station to station. To complete the hydraulic package, 24 RACINE Model Q Pumps serve the standard self-contained drill units. R. S. Naeyaert, President, adds, "RACINE flexibility in delivering pressurized oil in *variable volume* at *varying pressures* make it the ideal choice."

The HEARTS of this automotive transfer operation are the compact RACINE *Power Units equipped with*

MODEL 4FA
VARIABLE VOLUME
VANE-TYPE PUMPS

RACINE

Racine Hydraulics & Machinery, Inc.
RACINE, WISCONSIN
HYDRAULICS DIVISION

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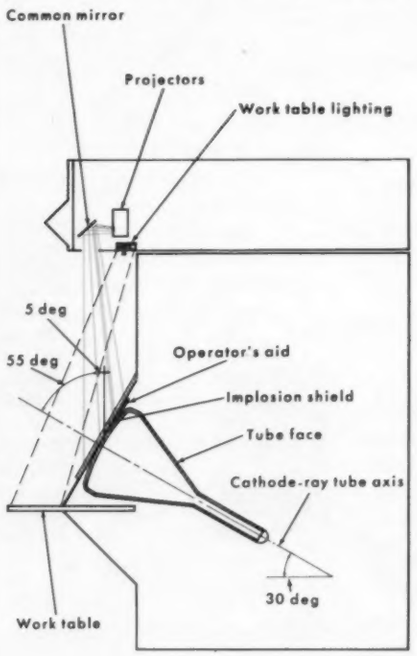
Optical System Projects Data

Lars G. Soderholm, Midwest Editor

A random-access map-projection system provides supplementary data from a reel of 35-mm film projected directly on the phosphor screen of a cathode-ray tube. An added slide projector projects fixed information from a microfile card. The system includes automatic selection of data to be projected on the basis of a keyboard request.

In use, the equipment is mounted on top of a display console. The image projected downward establishes a geographical map reference with uniform intensity, minimum distortion and without parallax on the face of the 19-inch cathode-ray tube used in the display console.

Projecting the two different picture overlays from above onto a tube at a 30-deg angle to vertical requires a projection axis 55 deg off the cathode-ray tube axis. To achieve sharp focus at this angle requires an unusual optical system. The problem is complicated by the fact that the cathode-ray tube is spherical in shape. The image projected must be distorted to match the spherical coordinate system of the data generated electronically on the phosphor of the tube.

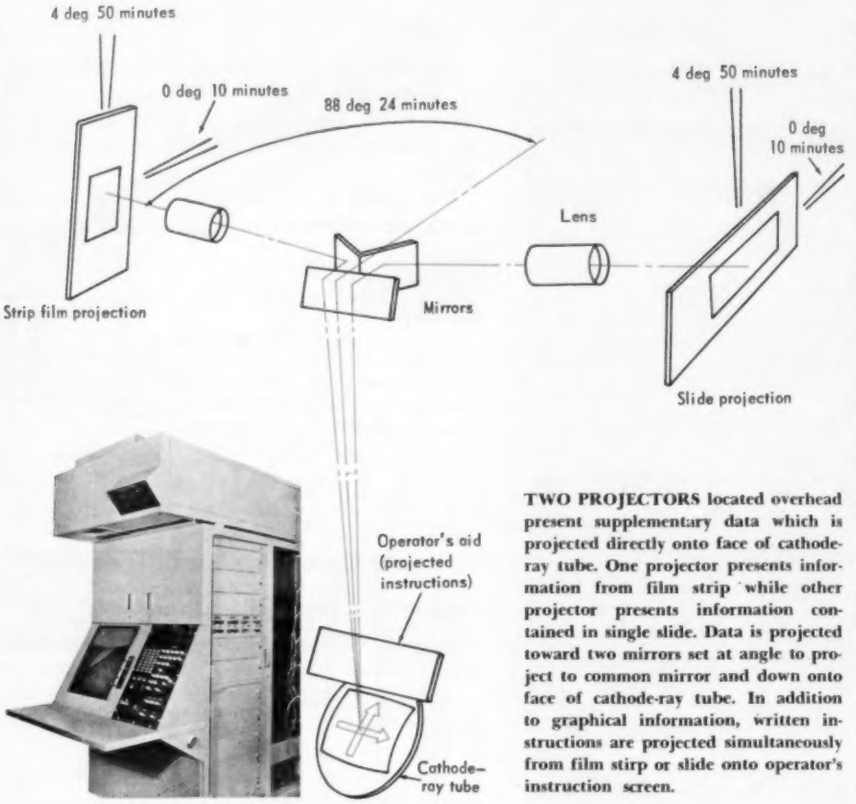


The film strip used in the system is prepared by photography in a complex studio copy camera in which the curvature of the cathode-ray tube and the spherical angles of the projection system are duplicated. The copy system is built so that the original material can have a pure rectangular coordinate system. Because of the great off-axis angle and the spherical screen, patterns on this film used in the projection appear greatly distorted when viewed directly but appear normal on the cathode-ray tube.

The 35-mm film reel has about 512 frames of picture. When the keyboard is actuated, a logic system selects the appropriate frame number. Then a servomotor operates the film in high-speed search (about 100 frames per sec) in the proper direction to reach the desired frame of film. When the film is within about 10 frames of the desired frame, the servo shifts to a fine drive which positions the frame within 1/10 frame, or 0.075 inch of the correct position. This search takes a maximum of about 3 sec. When the servo has completed its job, it unclutches from the drive. A Pitman and star-wheel position the frame within about 0.002 inch of the correct location, following which the film is pressed onto two fixed locating pins that position it with a repeat accuracy of 0.0005 inch. These last two steps take an additional second. The selection, search and precision location of a specified frame in so few seconds represents a design achievement of many potential uses.

The random access map projection system was developed for the Bureau of Ships of the U. S. Navy, under a subcontract from Remington-Rand Univac, by the Mast Development Co., Inc., Davenport, Iowa.

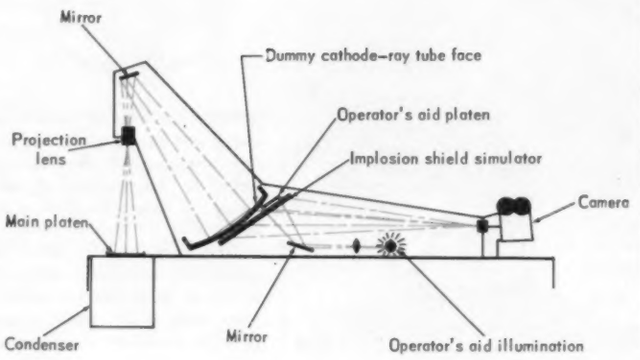
on Face of Cathode-Ray Tube

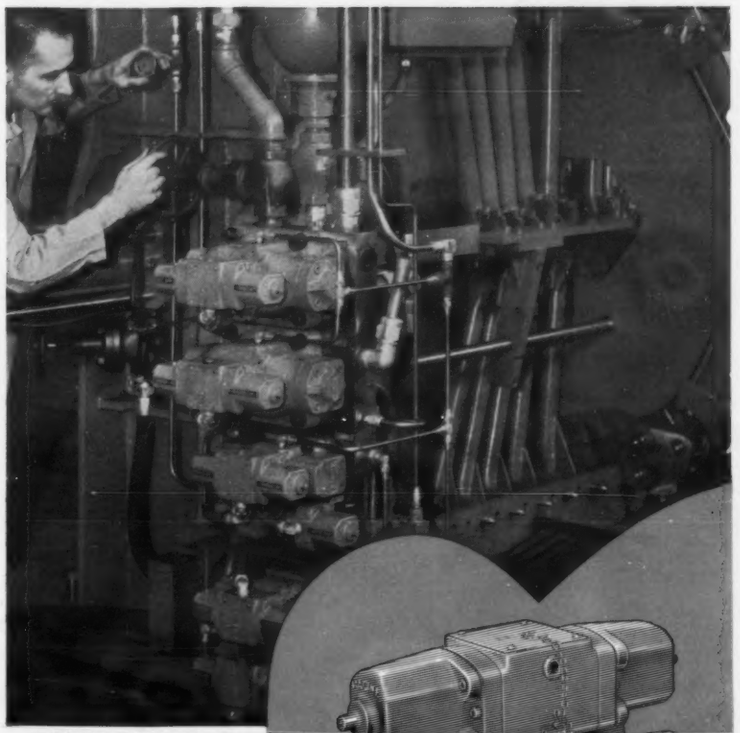


TWO PROJECTORS located overhead present supplementary data which is projected directly onto face of cathode-ray tube. One projector presents information from film strip while other projector presents information contained in single slide. Data is projected toward two mirrors set at angle to project to common mirror and down onto face of cathode-ray tube. In addition to graphical information, written instructions are projected simultaneously from film stirp or slide onto operator's instruction screen.



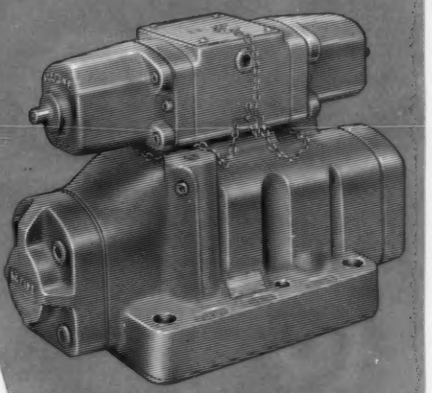
FILM PRODUCTION EQUIPMENT consists of setup similar to actual projection equipment through which data is photographed on 35-mm film for use in multiple data projection system. Both data and operator's instructions are distorted so they appear in their correct proportions when projected through unit.





HYDRAULIC VALVE SYSTEM OF WIRE-FORMING MACHINE BUILT BY RESEARCH DESIGNING SERVICE, INC., CENTERLINE, MICHIGAN

during set-up and at 3000 springs per hour



6 RACINE

Directional Control Valves guide hydraulic wire-forming operations of this machine

RELIABLE VALVES DIRECT THE POWER OF A HYDRAULIC HEART

"Control of all our hydraulic operations is vital, and this is possible with RACINE equipment," says Bill Karolle, electrical engineer with Research Designing Service, Inc. "Our hydraulic machines are used to form wire for 80% of all automobile seat springs." As oil requirements change constantly during set-up operations, 6 RACINE DIRECTIONAL CONTROL VALVES guide the *right oil volume* at the *right pressure* to the *right place* at the *right time*. At high production speeds, these 4-way, solenoid-controlled valves maintain the pre-set wire forming pattern with absolutely uniform precision. Valve reliability is important since these machines may perform over five million cycles during their lifetime.

RACINE

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3:8 to 1 gear ratio for fast retrieve—stainless steel gears and ball bearings—high-nickel stainless steel parts—automatic bail lock—250 yd. capacity spools—epoxy finished aluminum housings for strength—weight only 20½ ozs.—are some of its outstanding features.

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You, too, can set your standards as high as you wish—then confidently give your specifications to Mt. Vernon and relax. You'll get champion castings. A call to your nearest Mt. Vernon field salesman or our home office will get you prompt action.

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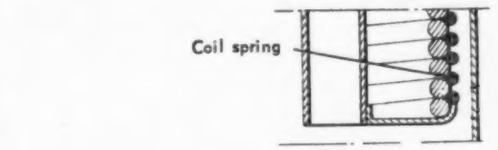
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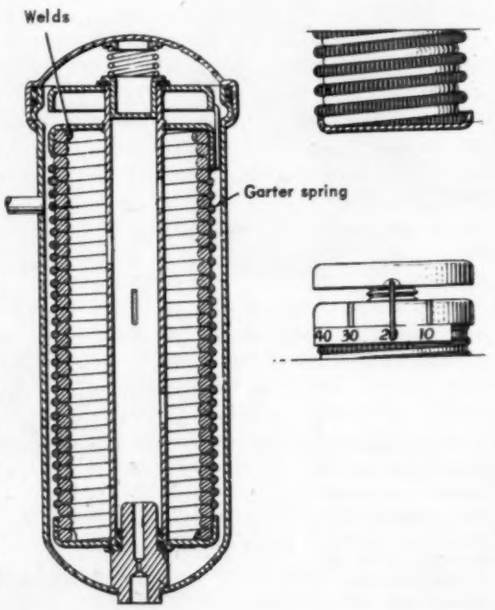
Garter Spring

Edward W. Schrader, Western Editor

A simple garter spring, wrapped in a helical manner around the oustside of a coil spring, serves as an oil filter. The coils of the garter spring lie in the grooves separating the turns of the coil spring.

The diameter of the wire used in the coil spring determines the strength of the filter to re-





SPRING filters as oil flows between wire turns. Both coil spring and garter spring are welded to end caps to separate incoming oil from filtered oil. Extension of coil spring by quarter-turn of center post stretches garter spring to adjust filter to different particle sizes. Same action may be used to flush larger particles from filter surface, thus cleansing filter. Spacing of turns in both springs has effect of creating depth-type filter. Actually, several of these filters could be placed concentrically for more filter action. Solid material in springs avoids loose particles sometimes encountered in sintered filters.

Filters Oil



FILTER ELEMENT normally is made of stainless-steel material. For special applications, supporting coil-spring structure could be replaced with plastic cylinder using perforated holes in helical pattern around its surface.

sist high-pressure flow through the filter. The pitch or spacing between wire turns of the coil spring plays a minor part in determining the size of particle which the filter will pass.

The coil spring primarily serves as the supporting structure for the actual filtering element —the garter spring. This element filters particle size according to the spacing between its coils. The garter spring is made from flexible cable.

The spacing between turns is either preset by stretching the cable as it is wrapped around the coil spring to make the garter spring on a fixed core, or it may be adjusted by extending the coil-spring core. The spacing between turns on the garter spring will increase as the coil spring is forced to extend. The latter technique provides a means of cleaning the filter.

In a normal condition, the garter spring is prestretched to filter the desired particle size. To cleanse the filter, the core or coil spring is extended to separate the turns of the garter spring, thus flushing the larger particles through the filter and removing them by means of a separate bypass connection.

The technique may be accomplished automatically. When the pressure drop through the filter reaches a predetermined value, a mechanical linkage could extend a sliding sleeve to uncover bypass ports in the container. Sufficient force could be created by the higher pressure to extend the spring for purposes of flushing.

The garter spring filter is a design development of Devco Engineering, Long Beach, Calif.



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With or without self-locking threads. Centering collar positions nut and protects threads from weld spatter.

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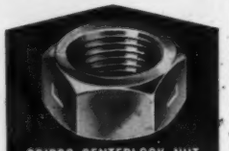
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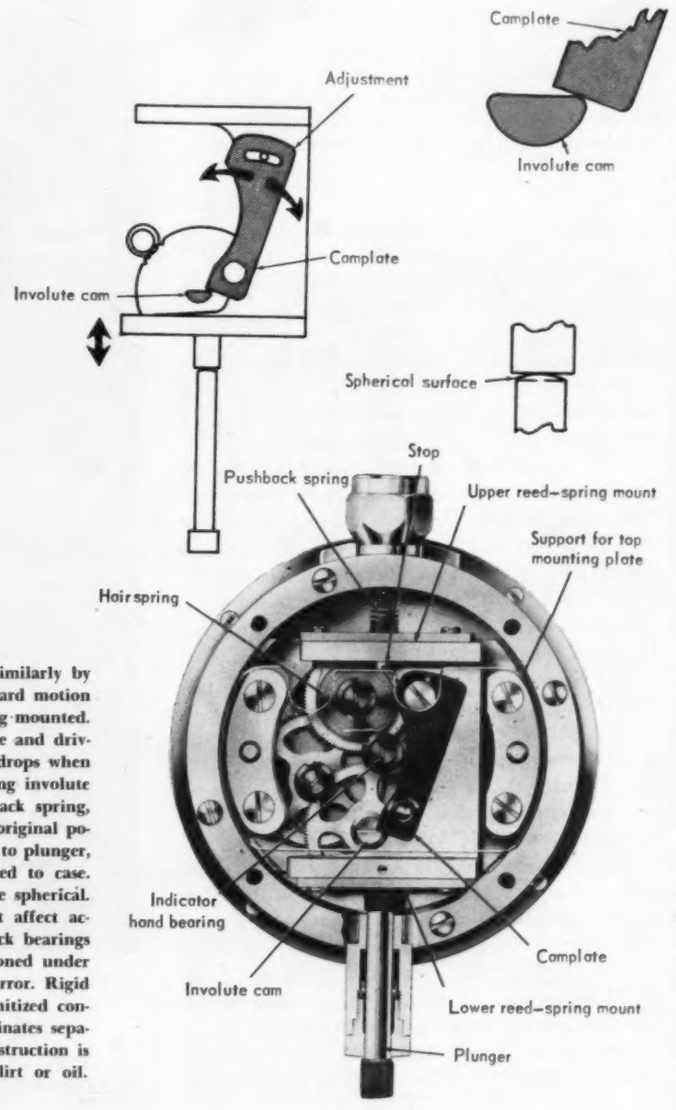
Involute Cam Section Improves Dial Indicator Accuracy

Victor W. Wigotsky, Eastern Editor

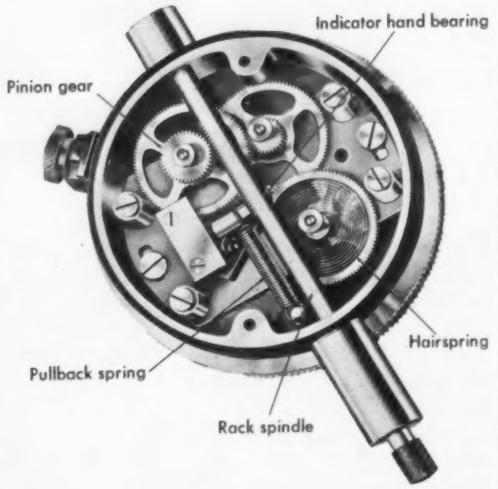
An involute section on a cam replaces the conventional rack pinion in a new dial indicator mechanism. A highly finished, precision surface then can be produced. This eliminates gear tooth engagement at a critical point where any inaccuracy is greatly magnified. Basic design of the cam mechanism and its associated gear train also permits a plurality of scale length's through multiple revolutions of the dial hand.

An essential objective of the new indicator design was to hold the repetitive error to not more than 10-millionths of an inch. The conventional gear and rack drive could not be produced to the exacting tolerances required. Designers were aware, however,





IN NEW INDICATOR, plunger is actuated similarly by placing workpiece in measuring position. Upward motion of plunger moves camplate, which is reed-spring mounted. Involute cam follows under hairspring pressure and driven gear train moves indicating hand. Plunger drops when workpiece is removed. Camplate follows, driving involute cam and gear train under pressure of push-back spring, until stop is reached and hand is returned to original position. Elimination of rack, normally connected to plunger, permits simple plunger assembly to be screwed to case. Surfaces of outside and inner contact areas are spherical. Any side play at outside bearing then cannot affect accuracy. In conventional indicators, wear in rack bearings results in lost side motion, as parts are positioned under measuring contact, causing increasing repeat error. Rigid support for gear elements is provided with unitized construction featuring single cast plate. This eliminates separate screw-attached mounting posts. Entire construction is in labyrinth form that inhibits entrance of dirt or oil. Back joint is protected by O-ring.



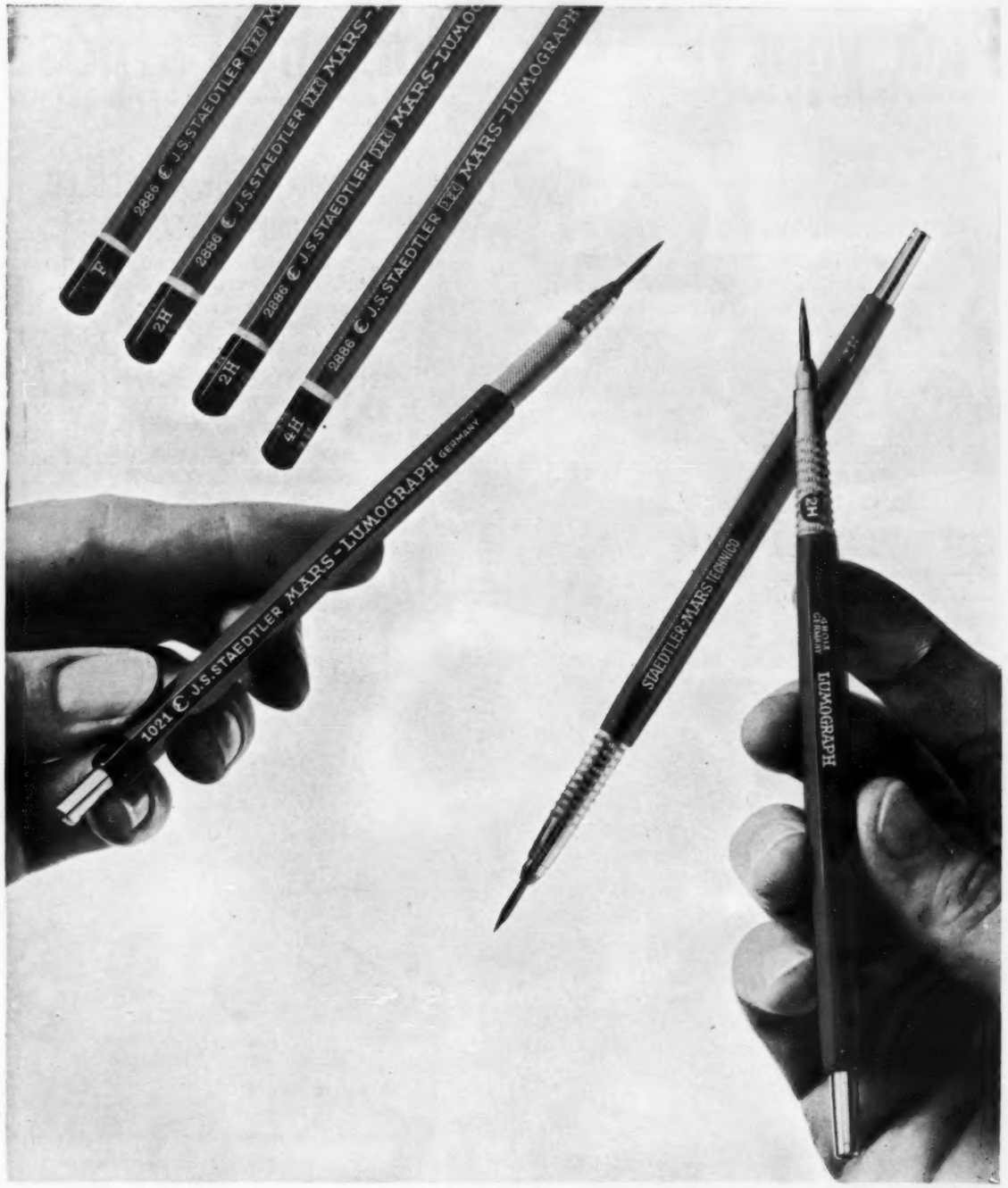
IN CONVENTIONAL DIAL INDICATOR, rack spindle is actuated by placing workpiece in measuring position. Motion drives pinion and gear train against pressure of pull-back spring and moves indicating hand. Hairspring provides antibacklash force. When workpiece is removed, rack spindle drops under pressure of pull-back spring, driving pinion and gear train until stop (in dust cap) is reached, thus returning indicating hand to original position.

that only a single gear tooth is involved when a dial indicator, with a travel of 0.010 inch per revolution, transfers linear motion of the rack to rotation of the pinion. A single involute section, with an effective travel of 0.025 inch (the pitch of one tooth), then was designed into a cam that could be hardened and ground to precise tolerance.

The cam is positioned in relation to a camplate so that movement follows, rather than being driven by, the actuating device. Normally, a pinion is driven by a rack attached to the plunger. This produces dial-hand motion through a magnifying gear train. In the new design, the plunger actuates a precision camplate in contact with the involute cam. The plate then permits the involute cam surface to follow its movement. This protects the gear train against any possible shock, as might occur if it were being driven. In addition, any shock-producing connection between plunger and gear train is eliminated. The cam is simply under a spring loading, with its low-torque gear train, so that it follows the linear plate displacement.

The camplate is supported in a reed-spring mounting which increases sensitivity by eliminating bearing friction. In addition, the mounting of the cam plate itself permits compensation for slight variations in magnification by adjusting contact angle between linear and rotary motion.

The "MicroSure" dial indicator was designed by Federal Products Corp., Providence, R. I.



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®T.M. for duPONT's Polyester film. *Shown.

the pencil that's as good as it looks **MARS**

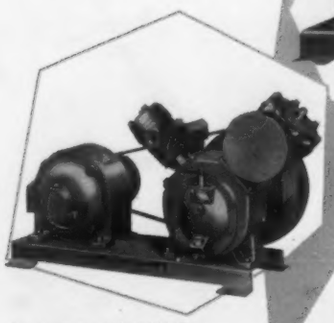
J.S. STAEDTLER, INC.
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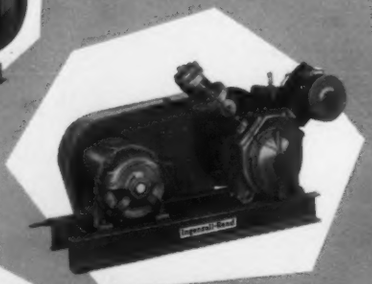
Pick your Pressure for any Purpose



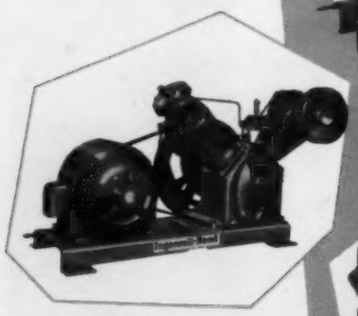
Ingersoll-Rand Model B
Single-stage ¾ hp
10 to 150 psig



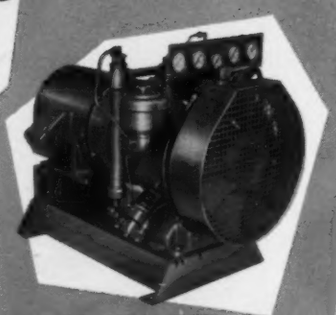
Ingersoll-Rand Model 7TX
Two-stage 7½ hp, baseplate mounted
100 to 250 psig



Ingersoll-Rand Model 7T2
10 hp, up to 500 psig operation



Ingersoll-Rand Model 41X5
5 hp, pressure rating to 1000 psig



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Collector Block Eliminates

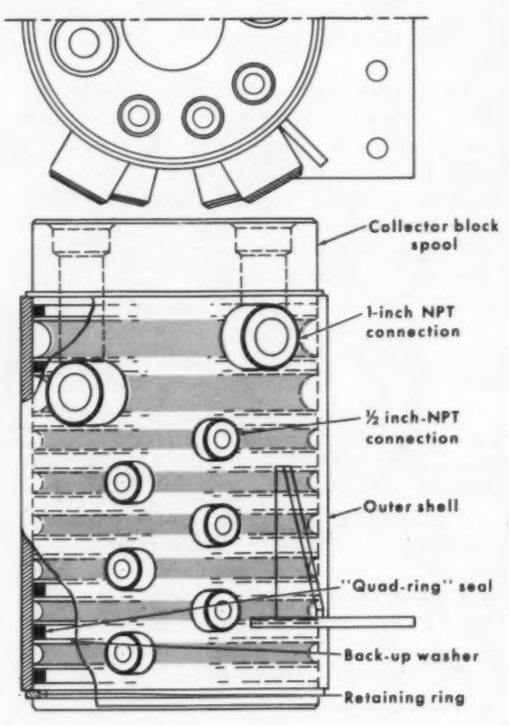
Lars G. Soderholm, Midwest Editor

A collector block, consisting of a stationary outer shell and a rotating spool section, is used to transfer hydraulic fluid and air to operating components on the derrick. This permits continuous rotation without limitation since the upper hoses rotate with the derrick and the lower hoses are stationary.

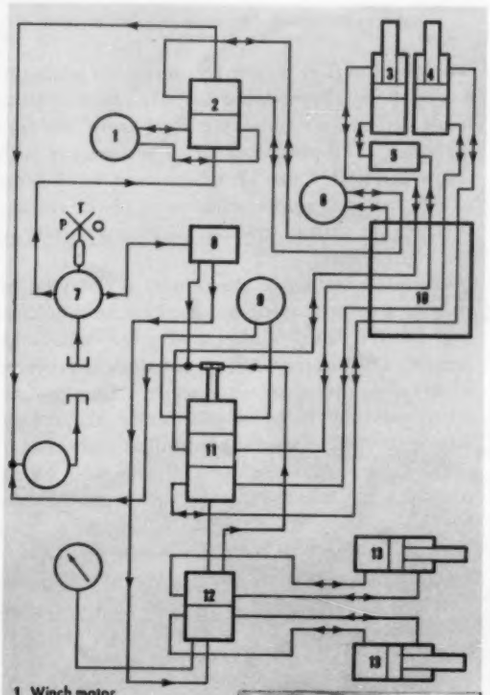
In hydraulic portable equipment, where one part moves in relation to the other, the use of flexible hoses is quite common. Under high working pressures, a reinforced wire hose is used which is weakened by twisting and often becomes the weakest link in the system.

The manufacturer of this truck-mounted derrick, wishing to overcome some of these limitations in his hydraulically operated unit, uses a collector block to connect the stationary and movable portions. In addition to eliminating hose twist, he also gained the possibility of continuous rotation and a cleaner, less cluttered appearance.

The collector block is used on the "Commander" series derricks manufactured by Tel-E-Lect Products, Inc., Minneapolis, Minn.



Hose Twist in Hydraulic Derrick



REAR-MOUNT ROTATING DERRICK using collector block as installed on truck chassis is shown in "RM" Commander unit. Note control station located beside boom.

COLLECTOR BLOCK consists of outer shell or cylinder assembly mounted to stationary portion of derrick and internal collector block spool attached to movable portion of derrick. Cylinder assembly has two 1-inch NPT connections for high pressures and return lines. There are six 1/2-inch NPT connections for other functions. Collector block spool contains series of machine grooves corresponding to connections in cylinder. Each machined groove is ported to equivalent connection in top face of spool. Grooves are separated by "Quad-ring" seals. Both hydraulic fluid and air can be carried through the collector block.

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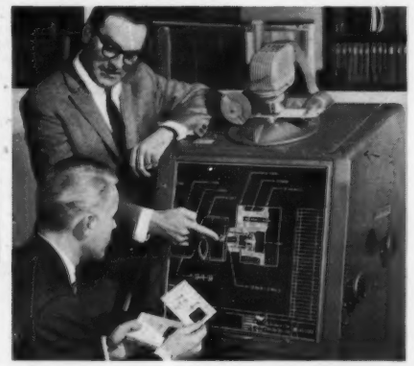
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A STOCK LEMPCO DIE SET HELPED H. K. METALCRAFT DO THE "IMPOSSIBLE"!

Winner of the John Woodman Higgins Award for 1961, Emil Loeffel, Metalcraft tool engineer, mounted his prize-winning dies in STOCK Lempco Die Sets, assembled to his order by a N. Y. City Lempco Distributor; see photos.

These dies produce, at $1.75 per thousand, a part which formerly cost $12 per thousand.

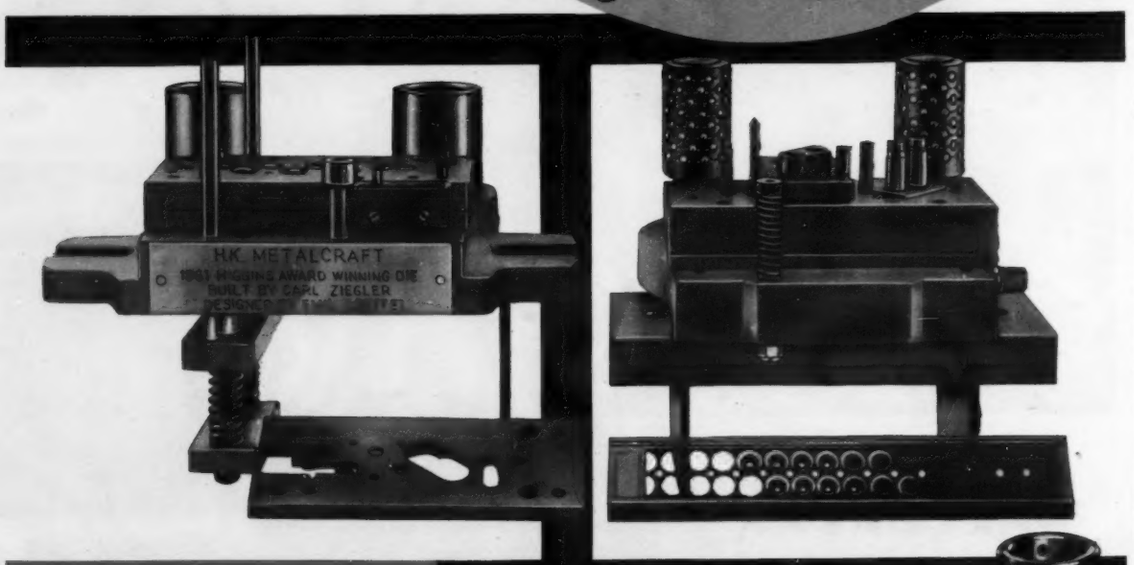
It was no accident that Lempco Die Sets were selected; Mr. Loeffel says he trusts their accuracy completely and adds, " . . . time saved in assembly and disassembly is very considerable".

Lempco Ball Bearing Precision Die Sets have long been known for this feature and for their ability to maintain exact alignment for millions of strokes, with an absolute minimum of maintenance. Why not find out for yourself all the advantages of using "prize-winning" die sets?

Lempco has a nation-wide warehouse organization. Write for literature and name of local distributor.



Photos Courtesy H. K. Metalcraft 10th Ave. at 203rd St. New York 34, N. Y.



LEMPCO INDUSTRIAL, INC.

Subsidiary of LEMPCO PRODUCTS, Inc. • Other Operating Subsidiaries: LEMPCO INTERNATIONAL, Inc. • LEMPCO AUTOMOTIVE, Inc., Automotive Parts Division • EVANS REAMER & MACHINE • Tractor Division

Bedford, O. Telephone GReenwood 5-2400

Circle 20 on Reader-Service Card for more information

Pins on Cartridge

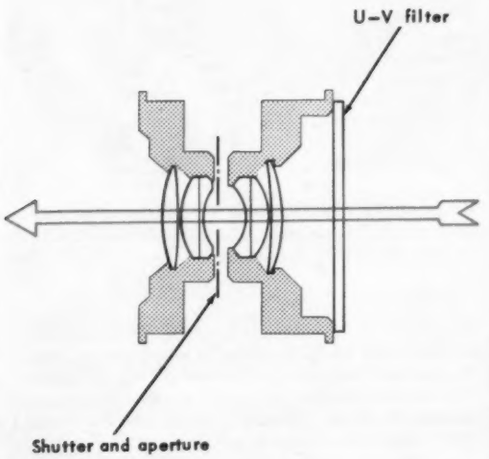
Volrath Holmboe, Correspondent in Sweden

The effect of film sensitivity on camera setting in a new 10- by 14-mm camera is taken care of automatically by two pins extending from the film cartridge. The pins, located in accordance with the sensitivity of the film, actuate a small lever which provides proper adjustment of the linkage between the shutter and the follow-up pointer in the light meter.

Complete setting of the camera is obtained by turning a control wheel attached to the shutter so that the follow-up pointer covers the light-meter needle. This simple setting procedure is achieved by keeping a fixed relation between time and aperture and by using a sufficiently short focal length to make distance adjustment unnecessary.

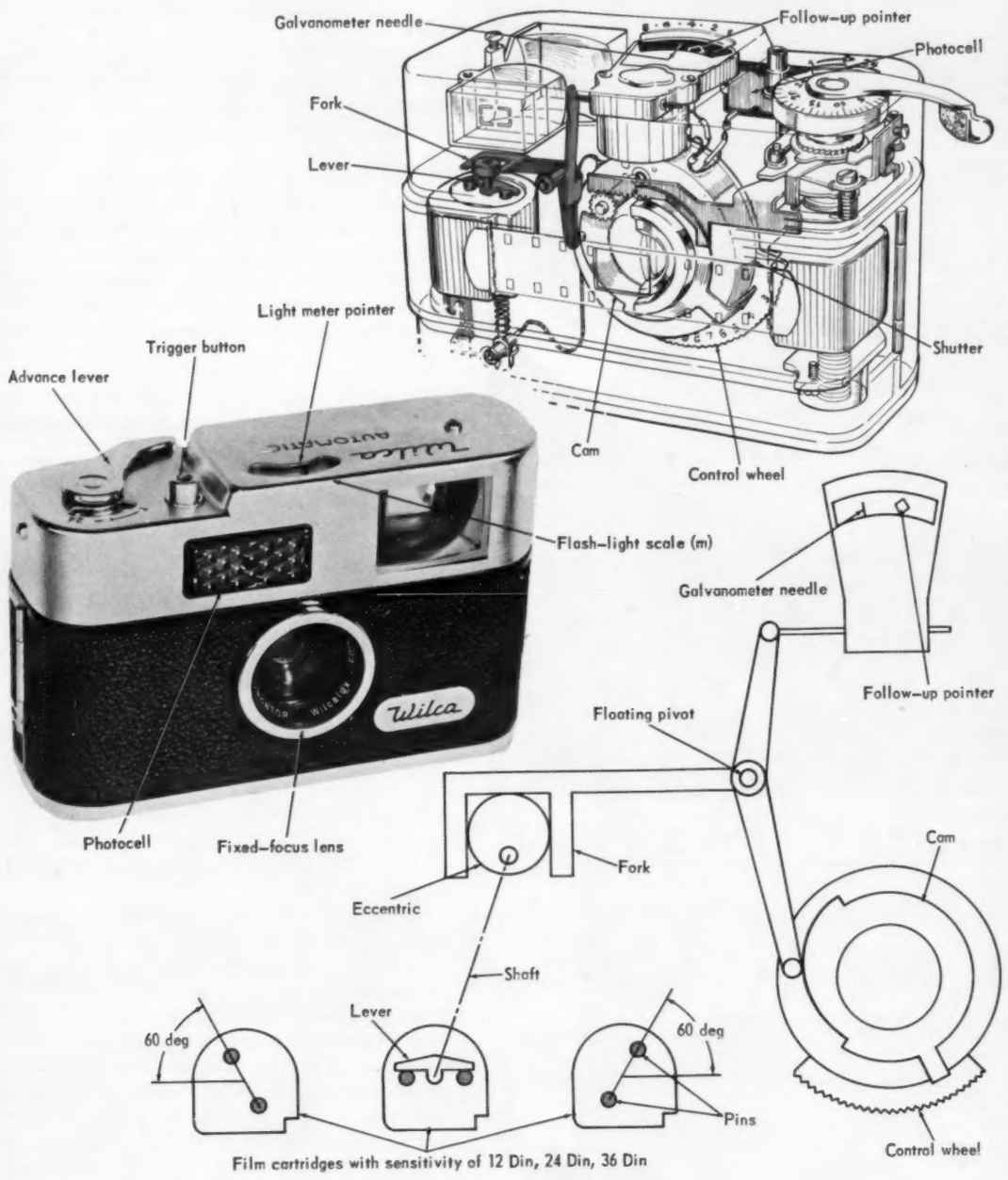
Further convenience is added by a scale on the control wheel which indicates the shortest "in focus" distance. A scale on the light meter represents the distance to the object when pictures are taken in flashlight. A hand lever advances the film and loads the shutter through rack and gear.

The Wilca Automatic camera is a product of AB Wilka, Halsingborg, Sweden. Dimensions are 110 by 72 by 40 mm.



FIXED-FOCUS LENS of lanthan glass permits focal length of only 16 mm. Short focal length provides reasonable sharpness from below 1 meter to infinity. Absence of distance adjustment aids mechanical simplicity. Ultraviolet filter with sunshade mounting protects lens.

Signal Film Sensitivity in Semiautomatic Camera



ANGULAR LOCATION of two pins on top of cartridge represents film sensitivity. When inserted in camera, pins move small lever which, through eccentric and fork, displaces pivot point for link between follow-up pointer and cam attached to shutter and control wheel. Movement changes basic deflection of follow-up pointer. Another location of pins represents another setting of shutter mechanism. "Prontor" shutter with single control wheel provides simultaneous variation of time and aperture according to preset schedule.

SOUTHWEST

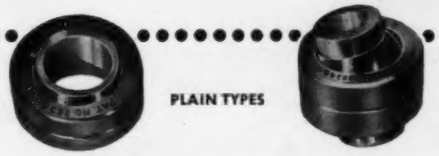
"Monoball"®

SELF-ALIGNING BEARINGS



ROD END TYPES

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PLAIN TYPES

CHARACTERISTICS

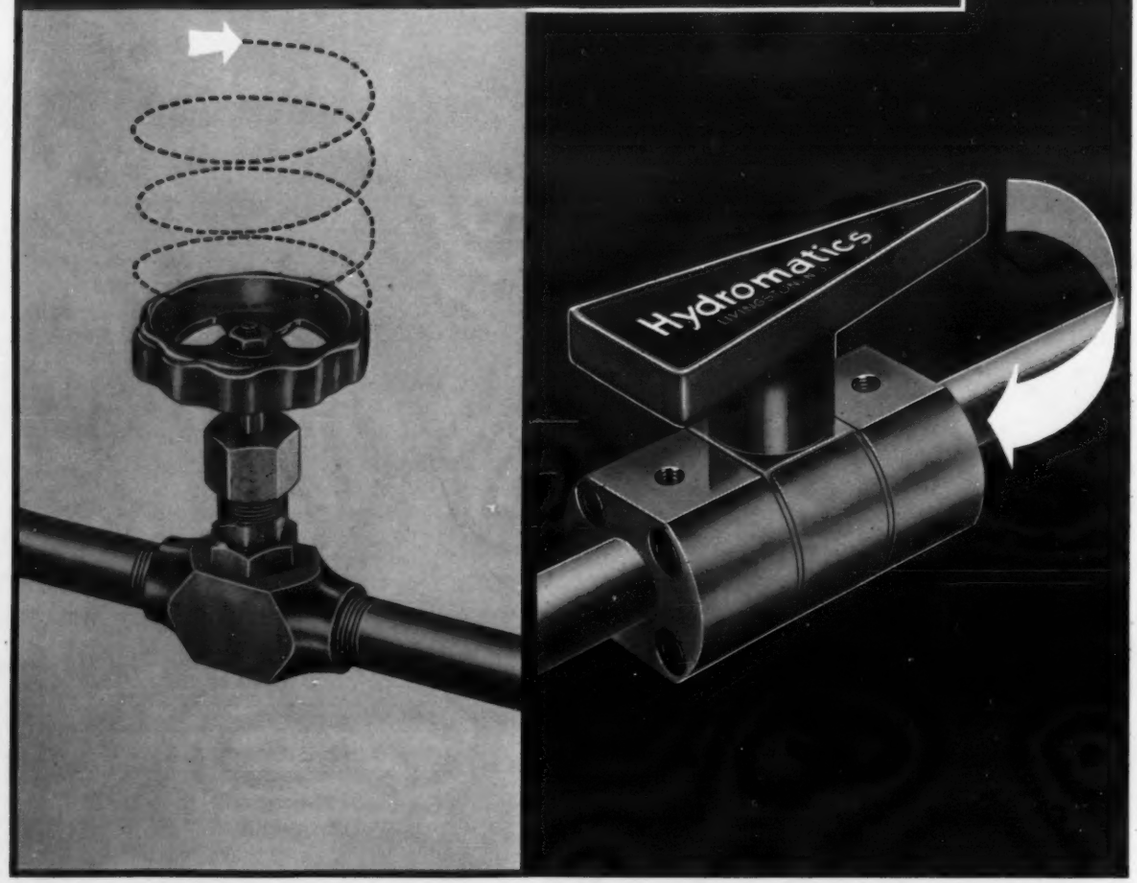
	ANALYSIS	RECOMMENDED USE
1	Stainless Steel Ball and Race	For types operating under high temperature (800-1200 degrees F.).
2	Chrome Alloy Steel Ball and Race	For types operating under high radial ultimate loads (3000-893,000 lbs.).
3	Bronze Race and Chrome Steel Ball	For types operating under normal loads with minimum friction requirements.
4	"Dyflon"® Plastic Alloy Inserts. CRES Ball and Race. Chrome Alloy Steels.	For types operating under rotational, high radial loads and long cycle life where lubrication is impossible.

Thousands in use. Backed by years of service life. Wide variety of Plain Types in bore sizes 3/16" to 6" Dia. Our engineers welcome an opportunity of studying individual requirements and prescribing a type or types which will serve under your demanding conditions. Southwest can design special types to fit individual specifications. Write for Engineering Manual No. 551. Address Dept. DN-61

SOUTHWEST PRODUCTS CO.
1705 SO. MOUNTAIN AVE., MONROVIA, CALIFORNIA

Circle 21 on Reader-Service Card for more information

FLO·BALL 715 makes needle valves obsolete



WHICH VALVE CLOSES FASTER?

Unlike the many turns required to operate a needle valve, the Hydromatics ***FLO•BALL 715,*** shown on the right, closes instantly with a mere ¼ turn . . . **positive action** at flow pressures up to 3,000 psi with just a 10 inch-pound torque! And the arrow-shaped handle shows both open and closed positions at a glance. Exclusive ***FLO•BALL*** straight-thru design has maximum flow efficiency—more than double the flow of needle valves.

Ideal for leakproof control of air, vacuum, steam, water, fuels, oils, kerosene, alcohol, etc., the ***FLO•BALL*** features zero leakage, universal mounting, removable flanges, and all stainless steel construction.

Write today for a complete catalog describing this valve and others for corrosive and cryogenic media. Also special designs for throttling flow control.

The *FLO•BALL* costs no more than old fashioned screw-type valves!

Hydromatics, Inc.

BLOOMFIELD, N. J. • PILGRIM 8-7000 • TWX—BLOOMFIELD N J 120

FLO-BALL

Circle 22 on Reader-Service Card for more information

Integral Drive Rod

Victor W. Wigotsky, Eastern Editor

The moving table of a vibration tester includes the drive rod as an integral element. Rigidity of the single element increases the natural frequency of the unit from 1000 cps to more than 2000 cps.

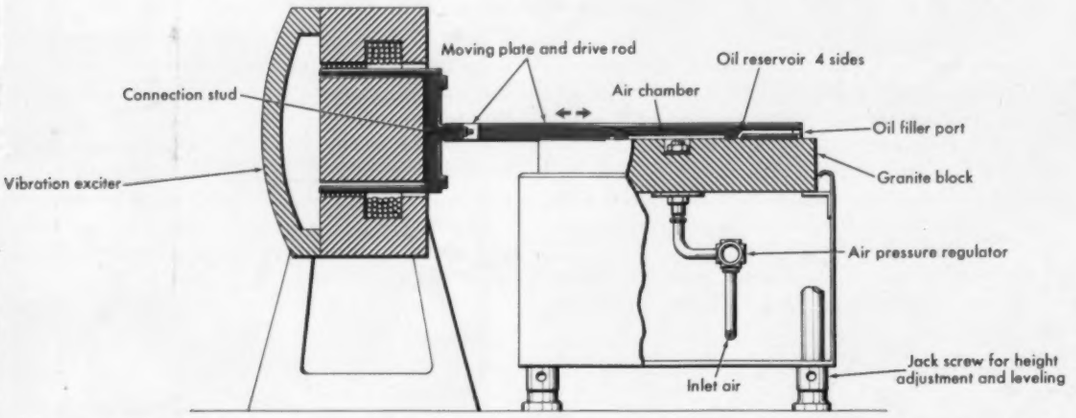
The drive rod, in the original design, is attached to the table by a series of bolts. Although this assembly has slightly less mass than the integral table and drive rod, the elastic coupling of the two connected parts limits natural frequency to 1000 cps. Greater rigidity of the single part offsets the slight mass increase and more than doubles the system's natural frequency. This satisfies the specifications of many vibration tests for reliability evaluations through a frequency range to 2000 cps.



New unit also features a combination air and oil system. An oil film supports the moving plate and allows longitudinal motion with minimum restraining force. At the same time, the oil viscosity aids in holding the plate down over the granite block by counteracting rotational moments about the center of gravity. The combination of free sliding with vertical restraint results in vibration testing in the driven direction with minimum extraneous motion. An air bearing prevents thinning-out of the oil film and also counterbalances any heavy vertical loads placed on table.

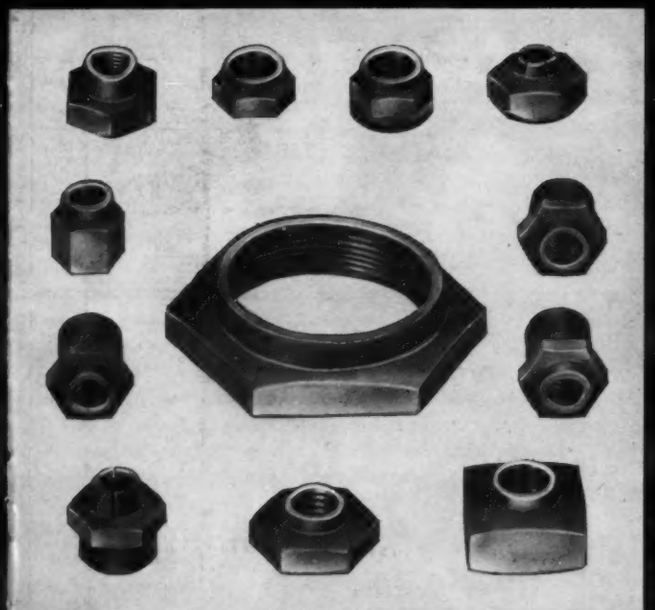
The "Vibraplane" is a product of Allied Research Associates, Inc., subsidiary of Boeing Co., Boston, Mass., and is marketed by MB Electronics, Div. of Textron, Inc., New Haven, Conn.

Increases Vibration Tester's Natural Frequency



DETACHABLE DRIVE ROD is bolted to moving table in original design. Elastic coupling in two-piece system lowers unit's natural frequency. Longitudinal natural frequency of moving table is increased with rigid single plate and integral drive rod. Latter then is connected directly to armature of electromagnetic vibration exciter. Air pressure permits recoiling of unit without removing plate from granite block and assures proper oil diffusion. Clamp-type lock nuts on legs, in redesign, permit force application perpendicular to screws. These replace original jam nuts to lock legs. Enclosed hollow chamber provides ballast area to stabilize base if needed.

SPECIAL LOCKNUTS . . . *that solved fastening problems*



As the largest specialized nut manufacturer in the world we are constantly developing new methods and products for this phase of assembly in industry . . . in the field of locknuts we have made spectacular progress. Besides standardized hexagon "Conelok," "Huglock" and "Marsden," sizes #10—3" of ferrous and non-ferrous materials, we provide many special application nuts, upon a basis of these designs . . . a few of which are here shown . . . Our sales and engineering departments are available to help you solve your fastening problems . . . Send for 12-page condensus catalog, it includes complete specifications of our entire product, as well as engineering data. We also have an one hundred and forty four page catalog where more comprehensive information is required.

Manufacturers of Standard and Special ferrous and non-ferrous Hexagon, Square and "12 Pointer" nuts . . . "Conelok," "Huglock" and "Marsden" locknuts.

NATIONAL MACHINE PRODUCTS COMPANY

an SPS company 44250 UTICA ROAD UTICA, MICHIGAN

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DRAWING BOARD NEWS No. 2

Published by Chart-Pak, Inc., originator of the tape method of drafting

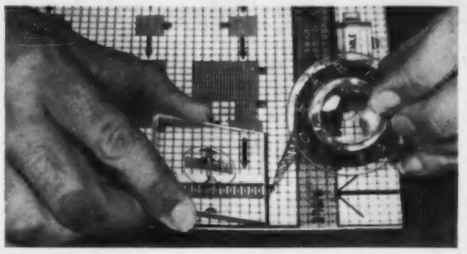


CHART-PAK TAPES LIGHTEN THE LOAD OF OVERWORKED DRAFTSMEN

Chart-Pak is good news for designers and draftsmen. It cuts down on routine "pencil pushing." It leaves more time for creative work.

Lines, bars, shapes, patterns and symbols don't have to be drawn. With Chart-Pak, they come on pressure-sensitive tapes and sheets. They just *press* down . . . quickly, neatly.

Even curved lines, as small as 1/64" wide can be "taped" on. And Chart-Pak is "goof-proof," too. It is easily lifted and moved . . . yet won't come off accidentally.

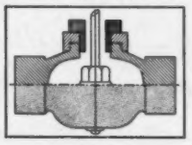
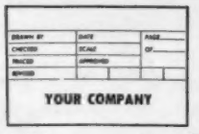


Chart-Pak Shading Films stick without burnishing — won't skid

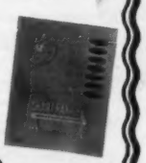
Chart-Pak shading films have a water-clear adhesive that sticks tightly to tracing cloth or paper with light pressure . . . without laborious rubbing down. They are also "skid-proof," even in hot reproduction machines. More than 100 patterns and 27 color tints available, on DuPont "Mylar"® .



PRE-PRINTED TITLE BLOCKS SAVE WORK



Draftsmen save work on every drawing, with "press-down" title blocks from Chart-Pak. Available printed to order—to read "right" or "reverse"—on clear or matte film. Quotations furnished on request.



NEW! "TAPE-SAVER" PACKAGE

Send for free catalog to help you take the drudgery out of drafting!

CHART-PAK, INC.

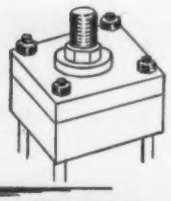
ORIGINATOR OF THE TAPE METHOD OF DRAFTING

241 RIVER ROAD, LEEDS, MASS.

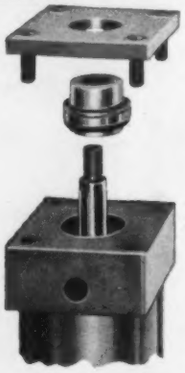
Dealers in principal cities in U.S. and Canada

Circle 24 on Reader-Service Card for more information

Why This?



When This Can Be Yours!



Mo-Bar Air and Hydraulic Cylinders cannot fall apart . . . because of loose tie-rods . . . when you remove the rod bushing and cartridge retainer plate of these cylinders.

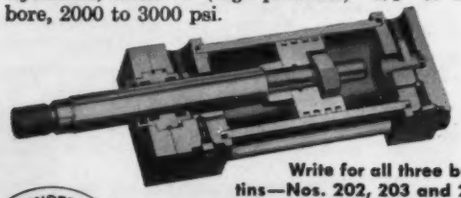
Mo-Bar's *exclusive* feature of using four (4) Allen Head cap screws in place of conventional protruding hex nuts . . . permits easy, quick replacement of the entire cylinder Rod Cartridge assembly . . . with cylinder barrel and tie-rods always permanently in place.

This Mo-Bar "first" gives greater design flexibility . . . particularly for cylinder mounting in tight places.

Other Mo-Bar "firsts" include (1) improved Rod Cartridge design where the long bronze rod bushing is *piloted* into cylinder head—not threaded—for maximum piston rod support . . . and (2) oil-heat resistant, self-adjusting Seal Guard wiper rings, with long conical taper, to throw off all harmful matter from piston rods.

The unique Mo-Bar compact design for air and hydraulic cylinders assures superior performance and unfailing dependability with positive, uniform actuation at all times.

There are Mo-Bar Air Cylinders, series 'a'—1½" to 14" bore, to 200 psi . . . Mo-Bar Hydraulic Cylinders, series 'm' (medium pressure)—1½" to 14" bore, 500 to 2000 psi . . . Mo-Bar Hydraulic Cylinders, series 'h' (high pressure)—1½" to 12" bore, 2000 to 3000 psi.



Write for all three bulletins—Nos. 202, 203 and 204—describing Mo-Bar Air and Hydraulic Cylinders for fluid power applications . . . Dept. A

MO-BAR HYDRAULICS CO.
Crystal Lake, Illinois

Circle 25 on Reader-Service Card for more information

Inverted Spring Arrangement

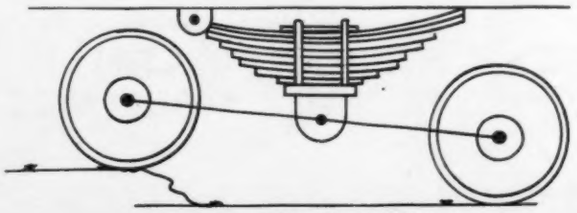
E. J. Stefanides, Central States Editor

A suspension for tandem truck axles in universal service uses longer, more resilient springs in an inverted arrangement that eliminates the rigid walking beam support at the axles. The resulting suspension provides better riding qualities and improved operating characteristics. It also effects a 25 percent reduction in weight over that of conventional suspensions.

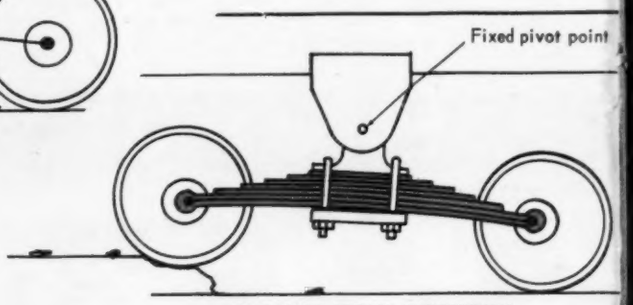
Normally in tandem suspensions, axles are mounted on each end of a rigid walking beam. The beam is pivoted about a trunnion suspended from a stiff leaf spring, fastened on one end to the frame through an eye.

With this arrangement, the spring center pivot must deflect to half the height that a wheel is displaced in riding over an obstruction. This requires a somewhat stiffer spring to absorb the loads and also causes the center pivot to be shifted backward, disturbing parallelism.

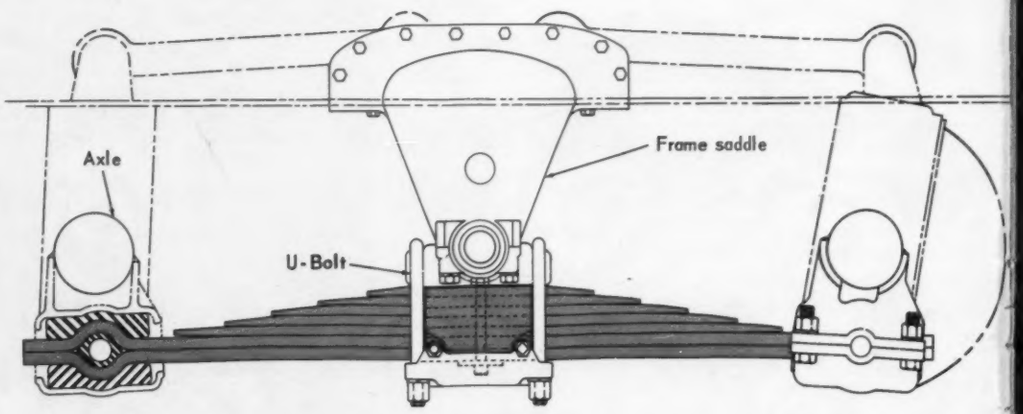
In the new suspension the axles support inverted



RIGID BEAM SUSPENSION



INVERTED SPRING SUSPENSION



SUSPENSION is mounted to frame by bolting or riveting. Axles are mounted to suspension by welding upper half of spring end boxes directly to axle housing. Section through spring end shows how moving parts at spring end are mounted in rubber to eliminate need for lubrication.

Improves Truck Handling



NEW SUSPENSION SYSTEM for tandem axle trucks uses longer, lower rate springs in new arrangement to provide improved ride and good tracking recovery. Unit is designed for and has been tested extensively in both on-highway and off-highway applications.

springs which pivot about trunnion pins fixed to the frame by saddles. Because of the fixed pivoting of the springs and the spring action not present in the rigid walking beam, a lower spring rate may be used to provide better riding qualities. Also because the center of the pivoted springs remains constant, the suspension maintains a more constant parallelism between the drive shaft and axis of transmission and engine. The parallelism does not vary more than 20 minutes from light to loaded conditions.

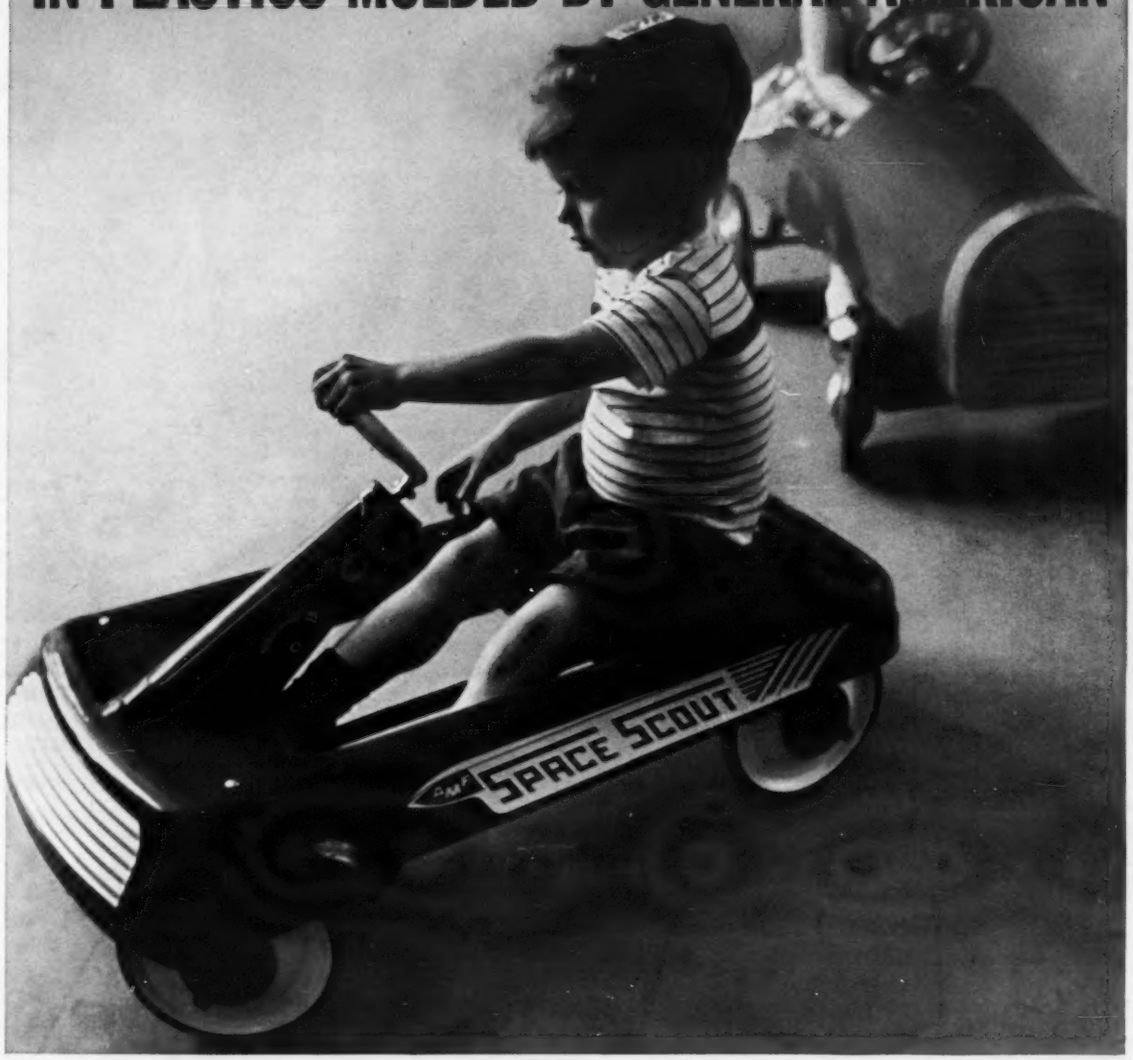
Of importance in service is the use of synthetic rubber bushings and pads at all pivotal points. The rubber components are arranged so that the moving parts are encased completely in rubber and do not require lubrication.

The unit, complete with saddle brackets and torque arms, weighs 761 lb as compared to 1026 lb of the conventional suspension. This weight saving is achieved primarily through the elimination of the heavy walking beams on each side.

The unit has been designed with springs of three different rates to cover off-highway and on-highway vehicles of from 28,000- to 38,000-lb tandem axle weights. All other components of the three suspensions are the same and may be interchanged.

The suspensions are designed and manufactured by the Axle Div. of the Eaton Mfg. Co., Cleveland, Ohio.

ALMOST ANYTHING CAN BE IMPROVED... IN PLASTICS MOLDED BY GENERAL AMERICAN



AMF wanted a durable, lightweight, inexpensive child's car body. General American helped provide the answer.

Every youngster can now drive around in style—and the Junior Toy Division of AMF has an exceptionally marketable entry in the truly compact car field. By replacing metals with molded plastics in the body and steering column, General American helped AMF save over two-thirds on tooling costs alone. What's more, there are fewer assembly operations and the color is molded right in. Even silk screening on the sides is done by General American before these components are delivered to AMF. The lighter weight cuts shipping costs, too.

Resourceful solutions to plastics problems are to be expected at General American, where plastics specialists are backed by the largest and most varied molding facilities in the world. For the Space Scout, General American specialists helped engineer the components, made and tested the prototype, developed the method of silk screening, and then molded the parts of high density polyethylene.

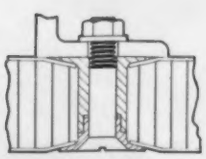
If you'd like to move more profitably into plastics, you'll certainly find it pa'' to plan with General American.

PLASTICS DIVISION
GENERAL AMERICAN
TRADE MARK

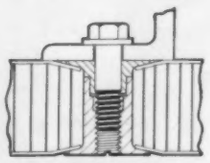
Plastics Division
GENERAL AMERICAN TRANSPORTATION CORPORATION
135 South La Salle Street • Chicago 3, Illinois • Offices in principal cities

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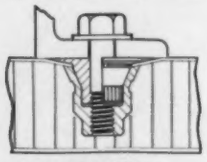
HONEYCOMB
and
sandwich panel
FASTENERS
PATENT PENDING
by Delron



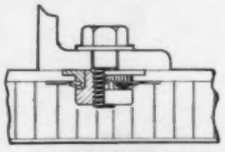
GROMMET FASTENER
Series 101 and 102
Thru-Rivet and Thru-Bolt Type



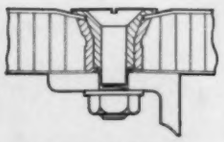
GROMMET FASTENER
Series 103
Series 104 (Self-Locking)



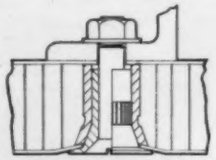
BLIND FASTENER
Series 293
Internal Thread Blind Type



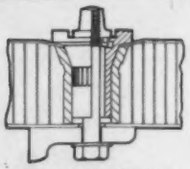
BLIND FASTENER
Series 293K
Threaded Clinch Type



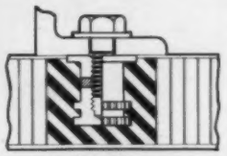
STRUCTURAL FASTENER
Series 600 Flared
Thru-Rivet and Thru-Bolt Type



STRUCTURAL FASTENER
Series 600 Regular
Thru-Rivet and Thru-Bolt Type

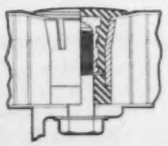


STRUCTURAL FASTENER
Series 700
Floating Locknut Type



MOLDED-IN INSERT
Series 404H
Blind Molded-in Type

Illustrated are only a few of the many available types of Delron Sandwich Panel Fasteners. Write for complete Technical Data.

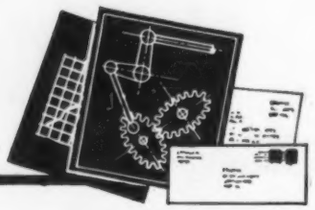


STRUCTURAL PLASTIC FASTENER
Series 680
Internal Thread Type

THE DELRON COMPANY, INC.
5224 Southern Ave., South Gate, Calif. • LOrain 7-2477
Largest Manufacturer of Specialized Sandwich Panel Fasteners.

Circle 27 on Reader-Service Card for more information

IDEA MART
DESIGN NEWS

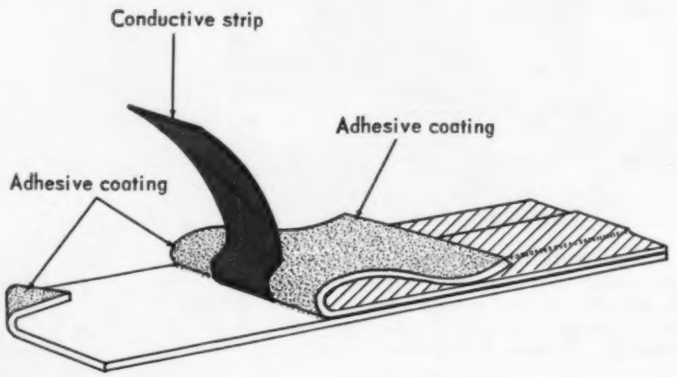


Ideas described in this department are in various stages of development and may be at any point from "initial concept" to "patented".

AVAILABLE

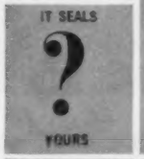
'Tapewire'

This patented product is a novel form of tape conductor which can be used as a substitute for wire in many applications. It consists of a piece of aluminum, copper or other ribbon-foil, sandwiched between two wider pieces of pressure-sealing tape. Single or multiple conductors may be used. Especially designed perforations permit access to the conducting foil. Connections may be made by soldering, welding, crimping or other special processes. Possible applications include windings, coils, fusing, heating, capacitive coupling and in wiring applications where fasteners are awkward. The inventor seeks interested manufacturers or marketers. Write IM 528, Idea Mart, DESIGN NEWS, 3375 S. Bannock, Englewood, Colo.



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ANY FLUID—GAS—FUELS—WATER—LIQUID METALS—CRYOGENIC FLUIDS—CORROSIVE FLUIDS
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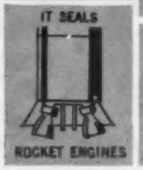




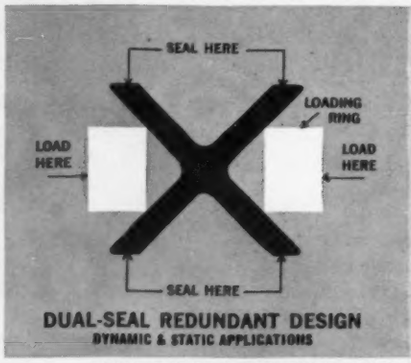












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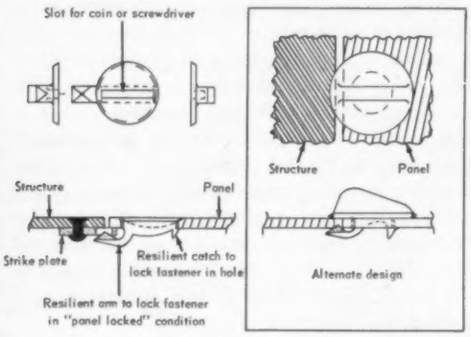
E. B. WIGGINS OIL TOOL CO., INC., Dept. C1
3424 E. Olympic Blvd., Los Angeles 23, Calif.
TWX 1403U, Phone AN 9-0181

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AVAILABLE

One-Piece, Quick-Release Fastener

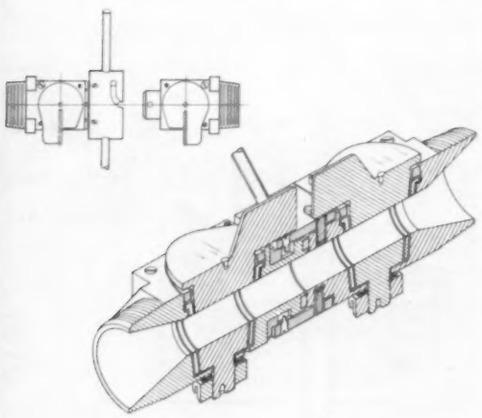
This one-piece molded nylon fastener is inserted in a hole and snapped into place without tools. A resilient arm on the fastener has a detent which positions in a hole in a striker plate or gap between door and structure. A quarter-turn or less removes the detent from the locked position and permits door removal. The unit may be made in various head styles and grip ranges for holding nonstructural doors or panels. Wish to sell or license. Write IM 527, Idea Mart, DESIGN NEWS, 3375 S. Bannock, Englewood, Colo.

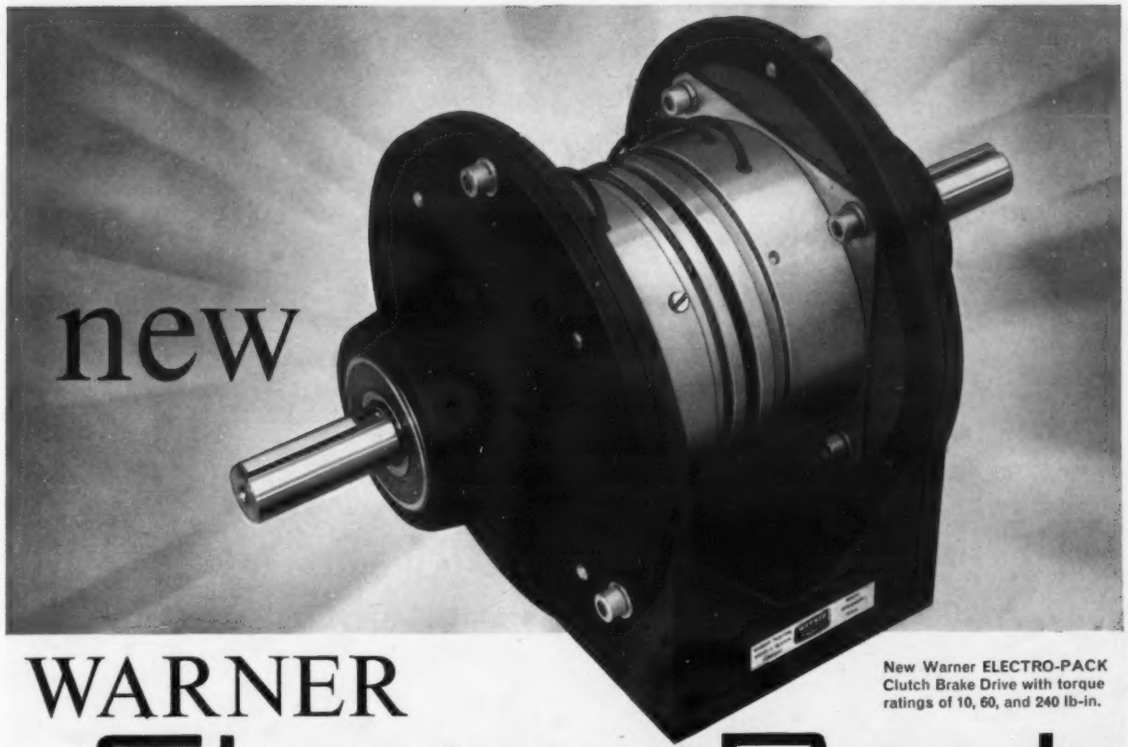


AVAILABLE

Quick-Operating Coupling

This coupling is adaptable to virtually any fluid or gas, especially liquefied gases at low temperatures. The unit may be used over a wide range of pressures and a wide range of temperatures. The coupling consists of male and female portions, each fitted with an integral plug or rotary-type valve and a means of connecting the two halves. An interlock insures shutoff before disconnection. An integral relief valve prevents buildup of excessive pressure in a line after shutoff, and a vent prevents buildup of pressure in the center chamber after both valves are shut. This connection is made in one quarter turn of the central portion without use of tools. The coupling is patented. Write IM 525, Idea Mart, DESIGN NEWS, 3375 S. Bannock, Englewood, Colo.





New Warner ELECTRO-PACK Clutch Brake Drive with torque ratings of 10, 60, and 240 lb-in.

WARNER Electro-Pack® CLUTCH-BRAKE DRIVE

Complete new "package drive" puts automatic cycling on your machines without engineering . . . without machining!

Preassembled! Prealigned!

Just bolt it down and wire it up!

This ready-to-install Warner "package drive" gives you a fractional hp clutch-brake unit assembled and ready to couple to an input and output shaft. Simply bolt it in place, hook up the lead wires and it is ready to go—*without* costly engineering or machining!

Rugged, reliable design

Lightweight and compact, the ELECTRO-PACK delivers high-cycle performance with rapid heat dissipation and freedom from maintenance. Sturdier, widespread, long-life bearings run cooler under all conditions.

Simple assembly, standard components

The ELECTRO-PACK incorporates *standard* Warner units, available all over the world. Service is simple, alignment fast and positive.

WARNER ELECTRIC

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Warner Electric Brake & Clutch Co., Dept. DN-9, Beloit, Wisconsin

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ALITE® Helps New Princeton-Pennsylvania Accelerator Unlock the Atom's Secrets

By accelerating protons around a ring 80-feet in diameter to velocities approaching the speed of light, smashing them into a platinum target to disintegrate some of its atomic nuclei and studying the particles that shower out, scientists at the Princeton-Pennsylvania Accelerator will be gaining new knowledge about nature's basic building blocks.

Because extreme tolerances must be met in order to maintain the necessary control of the protons, only components of the finest materials and most careful workmanship were acceptable for use in the new machine.

We're proud that we at Alite were selected to produce the high alumina ceramic spacers which support, position and insulate the magnet pole pieces in the Princeton-Pennsylvania Accelerator.

The Alite formulation used in fabricating the thousands of magnet spacers required is 98% pure aluminum oxide. Alite was selected because of its high dimensional stability—dimensional tolerances on these parts were specified to ±.0002 inches, or about the diameter of a human hair.

In supporting the pole pieces, which generate huge magnetic forces, the Alite spacers are expected to be subjected to unit loads as high as 40,000 psi.

If you need a material that is rugged . . . will withstand elevated temperatures . . . has superior resistance to corrosion, abrasion, thermal shock and nuclear radiation . . . that has exceptional dielectric properties . . . that can be metallized and brazed to metal parts to form a vacuum-tight seal—then perhaps Alite is your answer.

Tell us your specific requirements. Our ceramic specialists will provide all possible assistance.

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For detailed description and specifications of Alite, write for FREE Bulletins A-7R and A-40.

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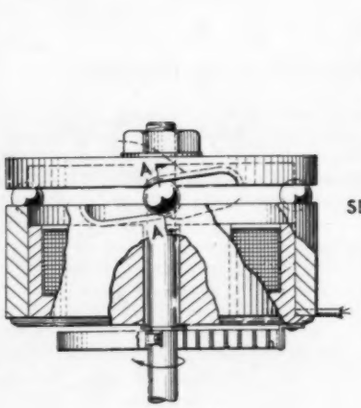
PATENTS

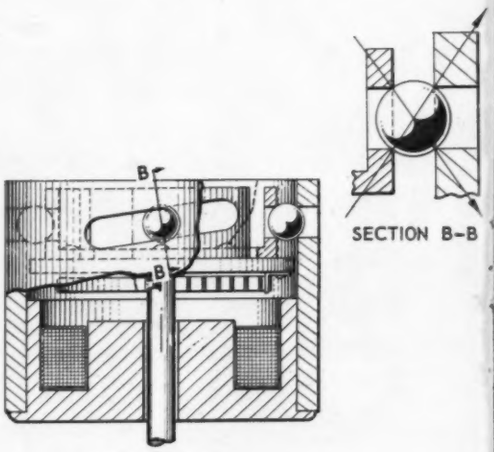
Rotary Actuator

U.S. Patent 2,978,915; Herbert E. Metcalf, Carol R. Metcalf, administratrix, Malibu, Calif.

This solenoid-operated actuator is capable of high stroke rate with low friction losses. Axial motion of the solenoid armature is converted into a combined axial and rotary motion.

The unit consists of relatively rotatable coaxial members, one of which is stationary and the other which is free to move axially and to rotate. Several pairs of opposed parallel-edged slots extend in circular and axial directions. A ball is placed in each slot pair, coupling the members. Balls bear on the slot edges. Axial motion of the movable member causes rotation because of slot direction and extent. The movable member may be the armature of a solenoid or may be connected to a solenoid core. Because the balls bear only on the edges of the slots, friction is reduced and torque per unit energy input is high.





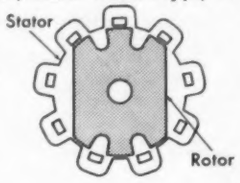
MODIFICATION

Self-Starting Synchronous Motor

British Patent 855,450; Albert H. Midgley, "Brookside", Thornhill Road, Moor Park, Northwood, Middlesex, England.

A new, compact, self-starting, clock-type motor has a permanent-magnet rotor. The field structure has two interspersed pole sets which have opposite instantaneous polarity when energized. Each rotor pole spans at least five stator poles and is divided by slots into three subpoles. Of these, the center subpole has greater circumferential length than the other two.

The polar angle between two adjacent rotor subpoles is made smaller than the polar angle between adjacent stator poles of like polarity. With this design the rotor assumes a minimum-reluctance, idle position when the field is de-energized but immediately starts when supply is switched on. The output shaft is driven through a simple gear train from the rotor shaft.

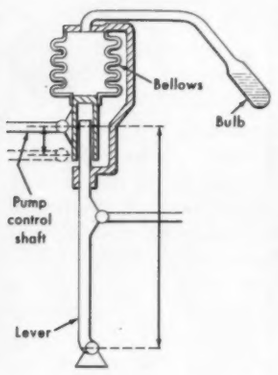


Fuel Pump Throw Regulator

Italian Patent 606,837; Alfa Romeo SpA, Italy.

This device automatically adjusts volume of fuel delivered by the pump of a gasoline injection engine as a function of air density and temperature. Lever arm of the pump control shaft is varied by an elastic bellows responsive to atmospheric pressure variations. The bellows is connected to a bulb partially filled with a highly volatile liquid. One end of the bellows is rigidly connected to the pump control lever, the other has a cap sliding on the lever. The pump control shaft is pivoted on the cap.

When temperature rises or air pressure drops, the bellows expands and length of the control lever arm is decreased. Suitable lever ratios result in fuel delivery adjustments required by the engine characteristics.



New Model

FRACTIONAL HORSEPOWER

DYNAMATIC AJUSTO-SPEDE® DRIVE

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Steps up Reliability and Durability

New in design but a veteran of proven dependability, the Eaton-Dynamatic Fractional HP Ajusto-Spede Drive offers a compact, low cost solution to adjustable speed control problems. Improvements include:

● **Longer operating life** ● **More uniform cooling**

● **Less noise and vibration** ● **Lighter weight** ● **Compact design**

The Ajusto-Spede Drive offers advantages not found in other methods of control. It is low in cost and easily installed. It is an integral combination of AC constant speed induction motor, eddy-current couplings, and single tube, electronic control. Special control functions, such as acceleration, inching, threading, cascading of multiple units, follower operation, constant tension and clutch motor operation can be provided by remotely mounted electronic controls.

Ajusto-Spede Drives operate on standard 115/230 volt, single phase, 60 cycle or 220/440 volt, 3 phase, 60 cycle alternating current. No special power source is required. Available from the manufacturer or from your nearest Dynamatic Distributor in sizes of ¼, ½, and ¾ HP at 1600 RPM and ½, ¾, and 1 HP at 3200 RPM. Can be supplied with either of two types of electromagnetic friction brakes and integral speed reducer in a wide variety of gear ratios.

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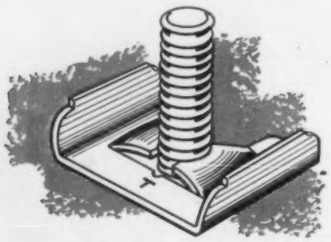
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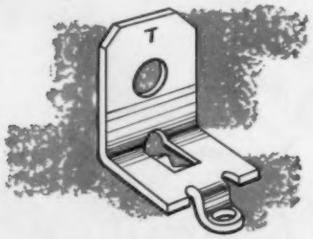
Published as a service to Designers and Engineers

Ideas from Tinnerman have cut costs, improved products. Here are examples from Tinnerman's 10,000 variations of SPEED NUT brand fasteners —all stamped with the T-mark of *total* reliability.

Tinnerman can help *you* cut costs with a free Fastening Analysis of your product. Call your Tinnerman representative, or write: *Tinnerman Products, Inc., Department 12, P. O. Box 6688, Cleveland 1, Ohio.*



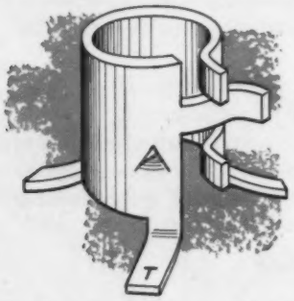
SIDE-SNAP SPEED NUT fastener, originally designed for fastening aircraft templates, can cut assembly time wherever long, threaded rods are used. This heat-treated, spring steel fastener snaps sideways onto the bolt at any point along its length. One turn to tighten and the job is done—*saving the time and cost of running nuts down the length of the long bolt.*



PANEL FASTENER saves welding costs in assembling enameled metal panels on store fronts, filling stations, and homes. This SPEED CLIP® fastener is rotated into self-retaining position in panel hole, then screwed to furring strip, *eliminating six to eight welding operations per panel.* One of many Tinnerman fasteners that cut time and costs in building construction.



MOLDING CLIP retains itself in panel hole until molding strip is snapped on at a convenient station on assembly line. Four spring fingers bear firmly on molding flanges, *prevent rattles due to vibration. Easily removed and reused.* Though originally designed for refrigerator applications, this SPEED CLIP fastener may be used on ranges, air conditioners, metal cabinets, paneling, and dash panels.



STUD CLIP solves retention problems at minimum cost wherever a .281" diameter plastic stud is used. Four of the SPEED CLIP fasteners *replaced 12 separate parts and four tapping operations* in a clock-radio assembly, and cut assembly time in half. Installation and removal requires only a pair of pliers. Clip offers superior shock absorption.

CANADA: Dominion Fasteners Ltd., Hamilton, Ontario. GREAT BRITAIN: Simmonds Aerocessories Ltd., Treforest, Wales. FRANCE: Simmonds S.A., 3 rue Salomon de Rothschild, Suresnes (Seine). GERMANY: Mecano Simmonds GMBH, Heidelberg.

TINNERMAN Speed Nuts®
Look for the Tinnerman "T"

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PATENTS

Torque-Limiting Disc Clutch

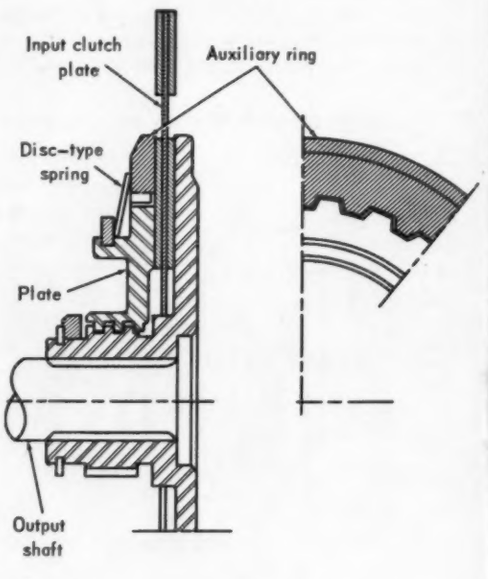
British Patent 859,312; Regie Nationale des Usines Renault, 8/10 Avenue Emile Zola, Billancourt, Seine, France.

Torque transmitted by this clutch, which operates in either direction, is limited by a spring-loaded, auxiliary ring splined coaxially to a plate mounted on a helical guide. Ring and plate can move axially to one another, and with axial and angular movement relative to the hub.

Torque received by the outer friction linings rotates the input plate and inner friction linings. Pressure exerted by the Belleville disc-type spring loads the auxiliary ring and causes the inner linings to transmit torque to the hub output plate and to the ring which drives the guide-mounted plate.

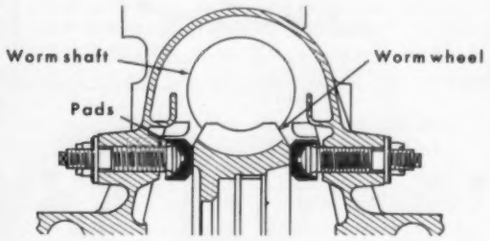
A large-pitch, multithread screw is used for the helical guide. A left-hand thread is provided if the input rotates clockwise. The helical guide causes the associated plate to bear with considerable force, dependent upon helix angle and surface frictional coefficient.

If torque direction changes, the auxiliary ring and guide-mounted plate will tend to be drawn in a negative rotational direction, relative to the hub. The guide-mounted plate will move away from the inner friction linings and come against the stop carried by the hub. Pressure determined by the disc spring continues to be exerted on the linings by the auxiliary ring. Torque transmitted by the clutch in the negative direction is thus lower than in the positive direction.



Worm Gearing

British Patent 861,585; John McHugh, Leyland Motors, Ltd., Leyland, Lancashire, England.

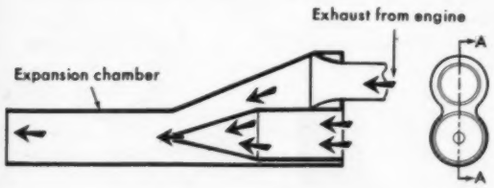


Adjustable stationary thrust pads, each carried on two stems screwed into the axle casing, laterally support the worm wheel rim adjacent its engagement with the worm shaft. The design reduces worm wheel tilt and twist when a vehicle back axle is under heavy load, and thereby reduces wear.

To prevent excessive friction, pad ends are chamfered, enabling worm wheel rotation to supply the central flat rubbing surface with lubricant. The stems have rounded heads which engage corresponding surfaces to permit slight pad rock. Running clearance adjustment is made when the gearing is not loaded. The stem square outer ends and locknuts are used to provide the adjustment. As load increases, pads come into operation.

Exhaust System

British Patent 865,822; Ronald Tinker, Middleton Junction, Manchester, England.



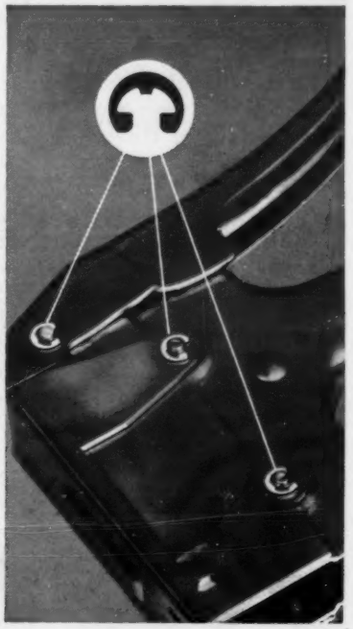
SECTION A-A

Exhaust gas expulsion from an internal combustion engine is accelerated by a pipe with a conical head fitted in an expansion chamber. An end plate situated on the expansion-chamber upstream end has two vertically aligned holes. The engine exhaust pipe is run through the plate upper hole to deliver the gases into the chamber. The coned pipe, with its upstream cylindrical end made as wide as possible, is secured to the lower hole in alignment with the chamber outlet. Vehicle movement causes air entering the coned pipe to pass through the reduced end aperture as a jet into the narrowest portion of the expansion chamber. This jet assists gas expulsion from the chamber.

Here's how ARROW FASTENER Co. gets

Truarc® Retaining Rings FREE!





U.S. PAT. NO. 2,837,812

Mechanized Ring-O-Mat® designed by Truarc Engineers doubles stapler production for saving of $2500/year

Arrow Fastener Co., Inc., Brooklyn, N. Y., uses three Truarc Series 5144 reinforced E-rings to secure components in its Model T-50 compression stapler. Originally, Arrow operators installed the rings by hand with conventional applicators and dispensers. Fast? Sure — but Truarc engineers suggested to the company how the job could be done even faster and more economically by mechanizing the entire ring assembly operation.

Working closely with the Arrow engineering and production staff, Truarc mechanization engineers designed the unique Ring-O-Mat shown above. The unit installs the three E-rings in a single operation, twice as fast as the former hand method. Savings with the equipment are $2500 a year — enough to pay for all the rings the company uses!

Here's how the Ring-O-Mat works. The Truarc rings are supplied in tape-wrapped Rol-Pak® cartridges which are loaded on vertical magazine rails at the center of the unit. To install the rings, the operator merely places the stapler in a nest at the front and pushes the control buttons . . . the Ring-O-Mat does the rest! Applicators connected to the air cylinders grasp the bottom ring in each stack and move forward, seating the rings in accurately located grooves pre-cut in pivot pins extending through the body of the stapler. When the rings are fully seated, the applicators are withdrawn automatically and the operation is completed. Simple, fast, fool-proof — a typical example of how Truarc retaining rings lend themselves to mechanized assembly. A good example also of how you get *more* than a fastener when you buy Truarc!

Interested in getting your retaining rings FREE?

Bulletin 459-13 describes a number of assembly techniques for mass-production ring installation. Write for a copy or see your Truarc representative.

WALDES KOHINOOR, INC.

47-16 Austel Place, Long Island City 1, New York

61-5

WALDES TRUARC® RETAINING RINGS

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TERRIFIC!

— and how long will the

flexing member last?

Good question. The heart of Para-flex is a tire with synthetic tension members bonded together in rubber—which provides a flexing body that automatically compensates for *all combinations* of misalignment and end float, and absorbs vibration as well!

This amazing coupling has now been used in American industry 4 years. Thousands are in operation—in steel mills, paper mills, oil fields, mines, quarries, chemical plants, everywhere—and in these 4 years, replacements of elements have been negligible.

Dodge Standard Para-flex takes angular misalignment up to 4°, parallel misalignment up to 1/8" and end float up to 5/16" depending upon the size of the coupling and the duration of shaft displacement.

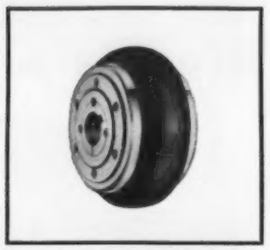
Dodge Para-flex is available in 3 types—Standard, Flywheel and High Speed (shown at right). The Standard type is stocked in capacities up to 3640 hp at 910 rpm. Ask your Dodge Distributor, or write us for complete technical bulletin.

Dodge Manufacturing Corporation, 300 Union Street, Mishawaka, Indiana

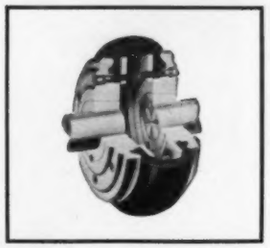
The Products with the Pluses . . .

DODGE

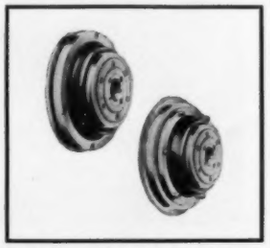
of Mishawaka, Ind.



The new idea in flexible cushion couplings, with a flexing member that "swallows up" misalignment.



No lubrication, no maintenance. Replace flexing element without moving driver or driven machine.



Flywheel and High Speed Types. For use with motors and internal combustion engines turning up to 5230 rpm.



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PATENTS

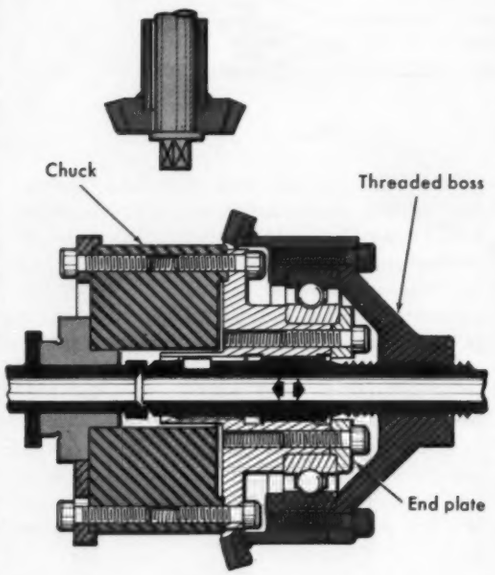
Pipe Coupling

British Patent 862,673; W. P. White, United Kingdom Atomic Energy Authority, London, S.W.1., England.

A bevel pinion on a tube and a coaxially mounted square-ended rod function together as remote controls to make and break a new coupling from behind radiation shielding. Two axially sliding pipe ends, with locating shoulders to define their movement range, are assembled in the coupling.

The left-hand pipe end is held in a conventional lathe scroll chuck operated by the rod square end engaging the chuck key. The right-hand pipe end is located in line with the left-hand end by screwing it into a cover plate with threaded central boss. A ball bearing in a housing secured to the chuck and cover plate supports a ring to which a bevel gear is welded.

To join the pipe ends, the bevel pinion is rotated in a direction to move the right-hand pipe end from left to right until arrested by the end plate. The left-hand pipe end then is inserted fully in the chuck and the jaws closed by turning the square-ended rod to centralize the assembly and prevent the pipe end rotating. The bevel pinion now is turned in the opposite direction to move the right-hand pipe end from right to left until its conical seat contacts the other pipe end. Further bevel pinion rotation forces the left-hand pipe end through the chuck until the inner shoulder abuts the jaw inner sides and tightens up the coupling. To break the coupling, the procedure is reversed.



The following list compiled from recent issues of the Patent Gazette gives you increased coverage of new patents whose details may be useful to product and machine designers. Copies may be obtained from the U. S. Commissioner of Patents, Washington, D. C. The price is 25c each.

FORCE-MEASURING INSTRUMENT
U S Patent 2,992,561; William G. Burt, Jr., Weston, Mass., assignor to General Communication Co., Boston, Mass.

TRANSMISSION ASSEMBLY
U S Patent 2,992,566; Wesley Max Walker, Fowler, Kan.

CONTROL CABLE TENSIONING DEVICE
U S Patent 2,992,568; Francis V. Benkovsky and Robert W. Siltamaki, Burbank, and William G. Morris, Van Nuys, Calif., assignors to Aero Mfg. Co., North Hollywood, Calif.

VIBRATION DAMPER ASSEMBLY
U S Patent 2,992,569; Ralph H. Katzenberger, Indianapolis, Ind., assignor to Schwitzer Corp., Indianapolis, Ind.

HYDRAULIC STROKE LIMITER
U S Patent 2,992,631; Walter J. Fallows, Jr., Grand Rapids, Mich., assignor to Lear, Inc.

FRICTION COUPLE
U S Patent 2,992,706; Howard B. Huntress, Suffern, N.Y., assignor to American Brake Shoe Co., New York, N.Y.

REVERSING HYDROSTATIC TRANSMISSION
U S Patent 2,992,712; Daniel F. McGill, 2344 NE 52nd St., Portland 13, Ore.

SYNCHRONIZER FOR TRANSMISSION MECHANISMS
U S Patent 2,992,714; Lucien Peras, Billancourt, France, assignor to Regie National des Usines Renault, Billancourt, France.

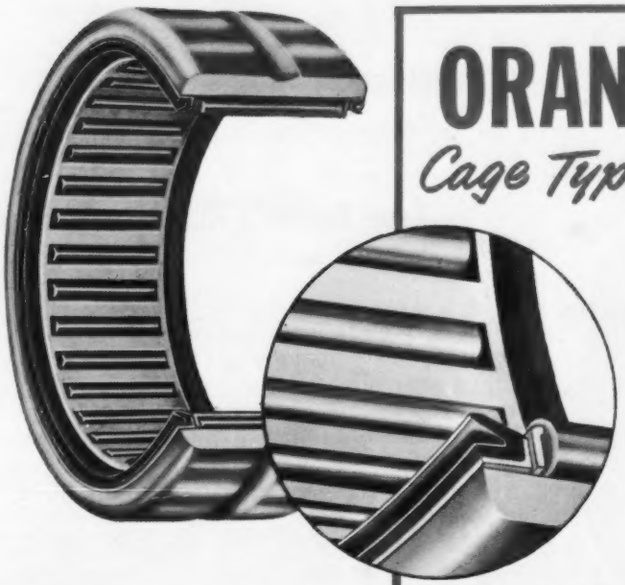
ROTARY FLUID COMPRESSORS
U S Patent 2,992,769; Lorenzo Manzanera, San Antonio, Tex., assignor to Petty Labs., Inc., San Antonio, Tex.

ROTOR CONSTRUCTION AND FABRICATION
U S Patent 2,992,810; Edward A. Stalker, Bay City, Mich., assignor to The Stalker Corp.

SHOCK ABSORBER
U S Patent 2,992,815; John T. Ellis, Jr., Maine Township, Cook County, Ill., assignor to Hanna Engineering Works, Chicago, Ill.

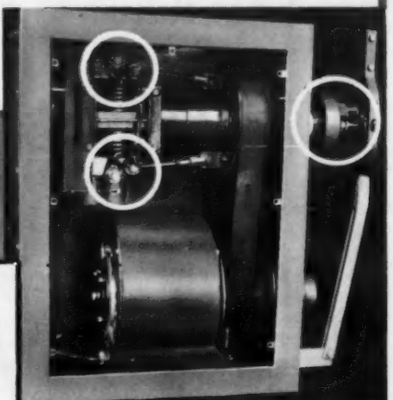
SEAL CONNECTION
U S Patent 2,992,843; Thomas R. Smith, Newton, Iowa, assignor to The Maytag Co., Newton, Iowa.

SPLIT SLEEVE-TYPE SHAFT CONNECTOR HAVING AN ELASTIC SLEEVE
U S Patent 2,992,844; William A. Williams, Philadelphia, Pa., assignor to T. B. Wood's Sons Co.



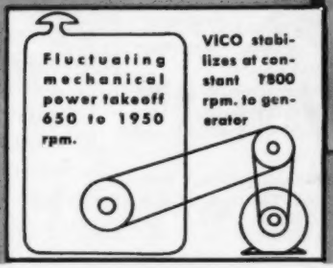
ORANGE SEALED
Cage Type NEEDLE BEARINGS

--simplify design
--reduce bearing space
--save production costs
for
Allmand VICO Generators



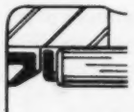
THE VICO is an ingenious generator and drive which is attached to any fluctuating mechanical power source on cranes, shovels, trucks, drill engines, etc., and converts it to electrical power with constant voltage and frequency, up to 5 KVA. Auxiliary gasoline engines for electric power are eliminated.

Ten Orange sealed cage type needle bearings are used—four double-seal bearings on each of the two governor arms and two single-seal bearings in the friction clutch. Allmand Brothers report these advantages: economy of design; bearing of small section to meet space requirements; and elimination of complex lubricating grooves in the clutch, by using single-seal bearings.



VICO Generators are manufactured by Allmand Brothers Manufacturing Co., Holdrege, Nebraska.

EFFECTIVE SEAL DESIGN
keeps dirt out--lubricant in



Built-in Neoprene seals provide positive exclusion of foreign matter—retain lubricant—and will relieve pressure, preventing displacement of seals when bearing is overlubricated.

- **Longer rollers for greater capacity**
- **TWO bearing lengths for flexibility**
- **Single or double seals to suit needs**



Double Seal

Only Orange construction provides effective sealing without reducing roller length or load carrying capacity. Only Orange provides two bearing lengths for each shaft diameter, with full length rollers in proper proportion to race for maximum load-carrying capacity. Orange cage design guides rollers to prevent skewing and provides exceptional lubricant capacity.



Single Seal

Orange Cage Type Needle Bearings are stocked in popular sizes from 1/2" to 2" shaft diameters. Other sizes available as volume requirements are established.

WRITE FOR ENGINEERING MANUAL M-59

ORANGE ROLLER BEARINGS

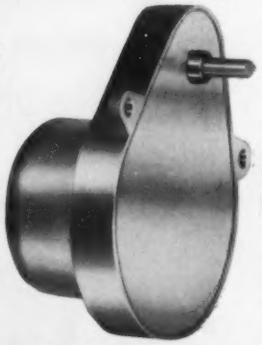
ORANGE ROLLER BEARING CO., Inc.
559 Main Street, Orange, N. J.

Needle Bearings — Staggered Roller Bearings
Journal Roller Bearings — Thrust Roller Bearings
Cam Followers

Circle 35 on Reader-Service Card for more information



this unique variable pole arm development



. . . in the NEW VP III MOTOR

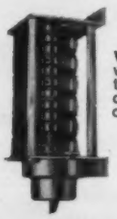
assures 100% STARTING RELIABILITY

To build your product better . . . or develop a new one . . . choose the VP-III synchronous motor. It's the only permanent magnet motor that starts *instantly* — even when rotor poles are in dead-center position.

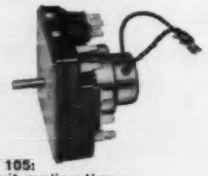
The VP-III motor's reliable starting characteristics stem from a unique, L-shaped variable pole arm. Whenever the poles of the rotor are dead-center, the field coil induces magnetism in this arm to turn the rotor.

Positive lubrication, heavy duty gear train and high output torque are added reasons why the VP-III motor helps you design better electromechanical devices. Write for full information to Dept. N.

Put greater promise in your product . . . specify precision Lake City timers, powered by VP-III motors for absolute reliability —



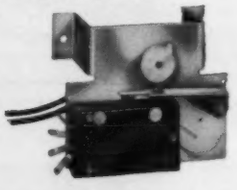
VC-300: variable cam timer, with one to eight circuits.



MODEL 105: 1-6 circuit cycling timer; positive-stopping design



CD-100: compact, 1-2 circuit timer; dust cover optional.



GT-100: general purpose timer with single DPDT or SPDT switch.

LAKE CITY, INC.
A SUBSIDIARY OF CONTROLS COMPANY OF AMERICA
CRYSTAL LAKE, ILLINOIS

LC-3-61

Circle 36 on Reader-Service Card for more information

Tape Reader's Magnetic Switches Control Printed-Circuit Motors

Victor W. Wigotsky, Eastern Editor

A high-speed photoelectric tape reader uses printed-circuit reel motors controlled by magnetic switches. Mechanical contact is eliminated. This avoids potential maintenance problems associated with conventional methods, since switching occurs approximately 100 times a minute.

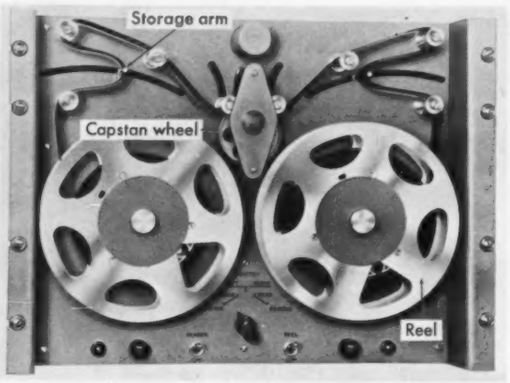
An individual storage arm on each reel controls its respective reel motor, while the amount of tape available in the loop, on either side of the reading head, controls the arm position. As a vane on each arm moves to its extreme limits, it is positioned between a magnet and the core of the magnetic switch. The shielding of the magnet's flux by the vane then fires a controlled rectifier.

The controlled rectifiers are positioned to turn the motor "on" and "off" in the direction required to maintain a constant tape loop. For rewind, the proper magnetic switch is activated to drive the prescribed reel motor and move the tape over the read head at speeds in excess of 1000 characters per sec.

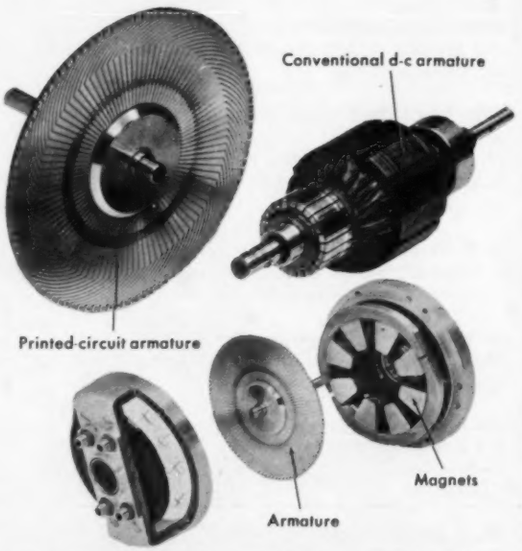
In the capstan drive, the design takes advantage of the fast response, because of low inertia, of the printed-circuit armature. Tape is advanced asynchronously up to 300 lines per sec without clutches, pinch rollers or brakes. Low inertia of the printed-circuit armature permits the motor itself to start and stop the tape precisely. This differs from conventional methods in which the motor runs continuously and is compensated by use of clutches, in conjunction with pinch rollers and brakes, to assure precise control of tape position. Elimination of these precision parts again reduces maintenance and increases reliability of the tape reader.

Tape advance is caused by an external pulse. The tape is stopped by an amplified signal from the sprocket, a selected read hole or from an external pulse. Speed of the tape, when reading asynchronously, is controlled by the frequency of advance pulses up to 300 characters per sec. If the stop signal is blocked, the free-running or slewing speed is 400 characters per sec. The capstan and reel servos permit a "stop on a character" at this speed.

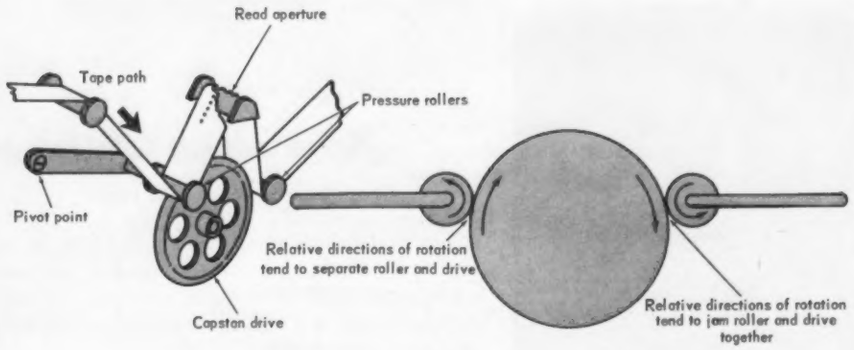
The Model 300R Photoelectric Tape Reader was designed by Photocircuits Corp., Glen Cove, N. Y.



CONTROLLED RECTIFIERS in each reel system provide one of two polarities to motor in order to take-up or feed tape for desired direction of rotation. Rectifiers are fired by high-frequency pulses controlled by toroid whose saturation is related to position of storage arm.



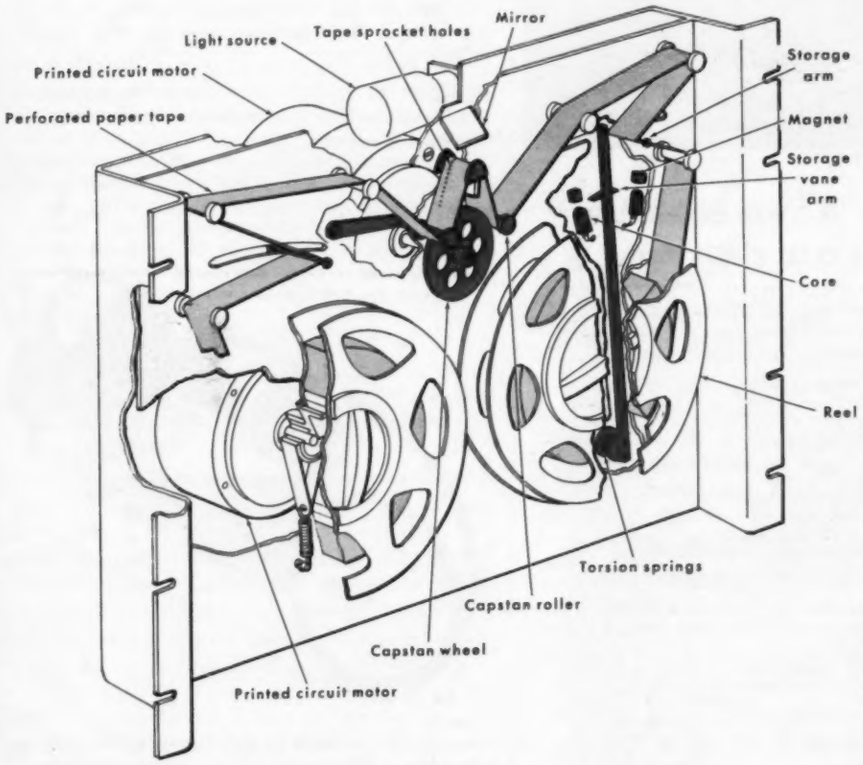
REDUCTION OF MECHANICAL TIME CONSTANT in capstan drive was achieved by raising motor's flux density to 13,000 gauss. Flux from magnets located on either side of armature is concentrated to produce this high density. It provides mechanical time constant of approximately 1 millisec. Since armature conductors are exposed completely on disc surface, continuous start-stop action is permitted without overheating problem encountered with conventional d-c motors.



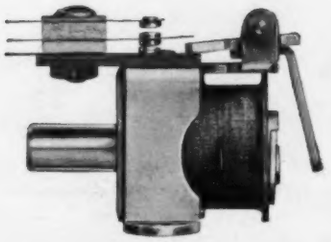
Left to right tape travel. If arrows are reversed in direction, functions change.

REVERSIBLE CAPSTAN DRIVE

BIDIRECTIONAL READING is possible while directly driving tape. Capstan wheel must pull tape across reading head. While this can be achieved simply in one direction, loop will not seat properly in read head when tape motion is reversed. Simple solution was found by pivoting rollers to "jam" on forward side of capstan wheel and holding tape firmly. Holding force automatically transfers to opposite side of wheel. For rewinding, capstan pressure rollers are removed from capstan by tape tension resulting from differential speed of reel mechanisms.



PHOTOELECTRIC DIODES which sense tape holes are located in line below tape. Holes consist of eight read holes and one sprocket hole. Reels remain stationary during small increment of tape motion. However, left storage arm is pulled progressively outward by tape and right storage arm is pulled inward by torsion spring, as tape is being fed into right loop. Left reel motor starts when storage arm on left moves to its outer extreme and supplies tape to loop. When storage arm on right moves to its inner extreme, motor removes excessive tape from loop.



"twofer"

With Heinemann's Type A Silic-O-Netic®, you get two relays for the price of one: a time-delay relay and a load relay. In one small package (shown actual size above), you get a time-delay relay that can double, if you wish, as a load carrier, too. (It's got a continuous-duty coil; you don't have to use auxiliary lock-in circuits or slave relays.)

The Type A tips the scale—barely—at three ounces. It comes with any delay you spec, from a quarter-second to two minutes, can be supplied for use on any one of twenty standard AC or DC voltages. Contact capacities range up to three amps. Maximum power consumption is two watts AC, three watts DC. Switching is SPDT or DPDT. Operating life is somewhere in the millions (the hydraulic-magnetic delay element is hermetically-sealed, fatigue-free).

The Type A (and the entire line of Heinemann time-delay relays) is described in full in our Bulletin 5003. A copy is yours for the asking.

HEINEMANN ELECTRIC COMPANY

105 BRUNSWICK PIKE TRENTON 2, NEW JERSEY

SA-2466

Circle 37 on Reader-Service Card for more information

Nickel-Cadmium Cells Extend

Edward W. Schrader, Western Editor

A passive network using two d-c supplies in a modified Wheatstone bridge detects minute amounts of combustible gases and toxic vapors, such as toluene and xylene, in concentrations far below the accepted MAC limits.

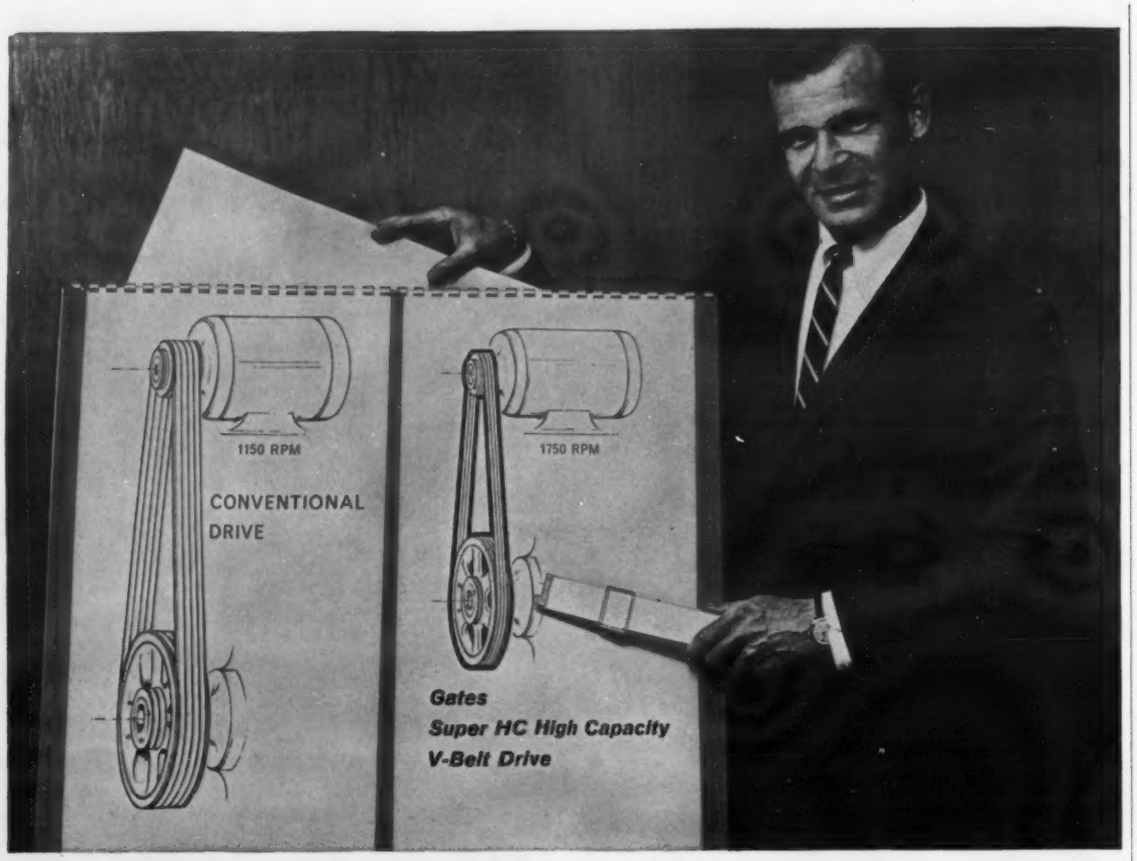
MAC stands for Maximum Allowable Concentration—the greatest concentration in parts per million (ppm) that man may safely be exposed to over the normal work day.

Although designed originally for use by industrial hygienists, the device is often used in arson investigations to establish whether kerosene or other flammable liquid was used to set a fire. In other applications it is used to control quality by detecting small concentrations of organic vapors given off during the processing of materials.

Nearly identical voltage is required from the two cells for the measuring milliammeter in the instrument. The milliammeter may be adjusted for slight variations in cells or filaments by means of two potentiometers, one for coarse zero adjustment and a second for fine adjustment in the bridge network.



AROMATIC HYDROCARBON INDICATOR with rechargeable nickel-cadmium batteries has sufficient capacity for 8 hr of continuous operation. Recharging is accomplished by plugging into 115v, 60-cycle a-c line. Charger is trickle-type, which supplies low rate of current sufficient to maintain battery capacity under normal service. Meter scale is calibrated for benzene, toluene and xylene. For other gases, conversion factor is applied to meter reading.



How Gates Super HC Drives can save space, weight, money on the machines you design

Ask your local Gates Man to design a drive for your machine two ways: A conventional V-belt drive and a Gates Super HC High Capacity Drive. A quick comparison will show you that the new Gates Drive costs up to 20% less than a conventional V-belt drive, weighs about 20% less and can handle your power requirement in ⅔ to ½ the space.

These advantages are possible because of exclusive, basic changes in V-belt shape and construction that permit this drive to transmit up to 3 times the horsepower of a conventional V-belt drive in the same space.

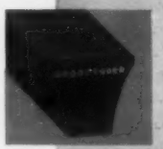
Manufacturers everywhere have standardized on the Gates Super HC Drive—the first and most advanced High Capacity Drive. It is your best assurance that your power transmission unit will remain up-to-date for many years to come.

The Gates Man, located near you, has had long, intensive training and experience in drive design. *Contact him for complete technical data on Gates Super HC High Capacity Drives and for expert drive design aid.*

The Gates Rubber Company, Denver, Colorado
BP54

Gates Super HC Drive Gives you these benefits:

- Saves up to 50% in drive space.
- Reduces drive weight 20% and more.
- Cuts drive costs as much as 20%.
- Reduces bearing load, increasing bearing life.
- Guards can be smaller, lighter weight.
- Belt speed up to 6000 ft/min possible without dynamic balancing.
- Less costly, higher speed motors can often be used.
- Jackshafts and outboard bearings can sometimes be eliminated.



Exclusive design features include: A Precisely Engineered Arched Top, Concave Sides, Flex-Weave Cover, super strength tensile construction.

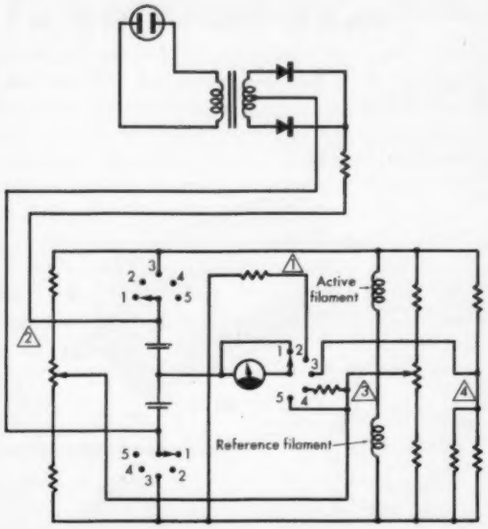
Gates

Building the future on 50 years of progress

Gates Super HC V-Belt Drives

Circle 38 on Reader-Service Card for more information

Life of Hydrocarbon Indicator



ELECTRICAL SCHEMATIC of modified Wheatstone bridge to measure concentrations of aromatic hydrocarbon vapors. Three switches are ganged together for simple operation: position 1 is off; position 2 is battery-voltage check; position 3 is voltage-balance check between batteries; position 4 measures hydrocarbon vapors up to 1.0 of lower explosive limit; position 5 checks for low concentration in parts per million range. In ppm range it is necessary to use drying agent in probe to eliminate humidity in samples, which would cause inaccurate reading.

A hand-operated squeeze bulb draws in a sample of air to be tested, through a probe and hose assembly. The sample surrounds an active filament of platinum wire. This element when heated has the property of acting as a catalytic agent in the presence of combustible gases. A current passing through the filament wire heats the wire to a temperature which makes the filament catalytically active. Combustible gas in the sample is burned at the surface of the wire. The amount of heat given off by the burning sample is proportional to its concentration.

This heat rise causes a resistance change in the bridge network, which in turn creates a corresponding current change in the sensing milliammeter. A reference filament in the other half of the bridge circuit is also made of platinum wire; its atmosphere is free of any contaminating gas.

The Aromatic Hydrocarbon Indicator Model SS is a design development of Johnson-Williams, Inc., Palo Alto, Calif.



Economy record on wall phones duplicated on new telephone

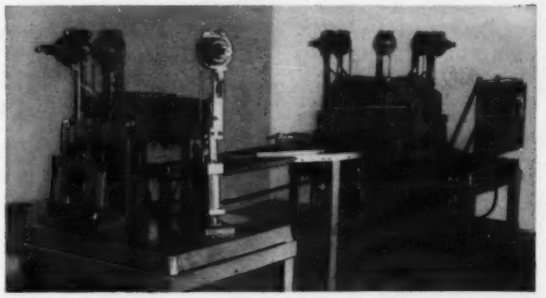
Western Electric had a ready answer for low cost assembly of the many components in the base of their new telephone. It had been developed by Western Electric engineers, with the help of TRS riveting experts, for a similar problem on wall phones.

It had paid off with a 35 percent labor saving and an 80 percent boost in production rate!

The Western Electric set-up described here is a production-proved example of what may be accomplished with the PAR Process . . . TRS Production Automated Riveting. Even though your assemblies are less complex, it will pay you to investigate the PAR Process. A TRS man may help you simplify and speed-up operations . . . minimize handling . . . decrease parts spoilage . . . through more automatic riveting and dependable quality TRS rivets. Often a TRS man can help achieve remarkable results from existing equipment. Always he'll have the style and size rivets you need.

11 Rivets Set in Complex Pattern in Only 2 Operations

Here is the specially engineered Multi-Head Riveter which helps cut costs for Western Electric. Eleven automatic riveting machines are combined with a specially designed rolling assembly fixture to minimize handling 5 parts of the assembly. In 2 operations, parts are attached to baseplate wih 11 TRS rivets in a complex pattern.



Don't Buy Riveting Machines until you learn how the TRS **PAR** *process revolutionizes riveting*

TRS®

TUBULAR RIVET & STUD COMPANY

QUINCY 70, MASSACHUSETTS • TRS SALES OFFICES: Atlanta • Buffalo • Charlotte • Chicago • Cleveland Dallas • Detroit • Hartford • Indianapolis • Los Angeles • New York • Philadelphia • Pittsfield • Quincy St. Louis • Seattle. MIDWEST FACILITIES AND STOCK IN CHICAGO. See "Yellow Pages" for phone numbers.

If it's a Tubular Rivet TRS makes it . . . and Better



Circle 39 on Reader-Service Card for more information

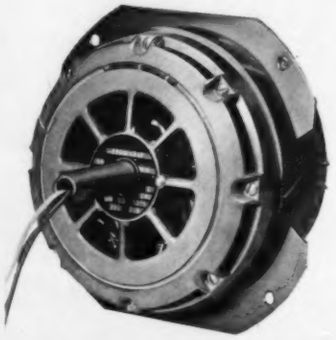
NEW PRODUCTS

Circle number on Reader Service Card for more information.

Squirrel-Cage Blower 301

Utilizes Inside-Out Motor for Direct Drive

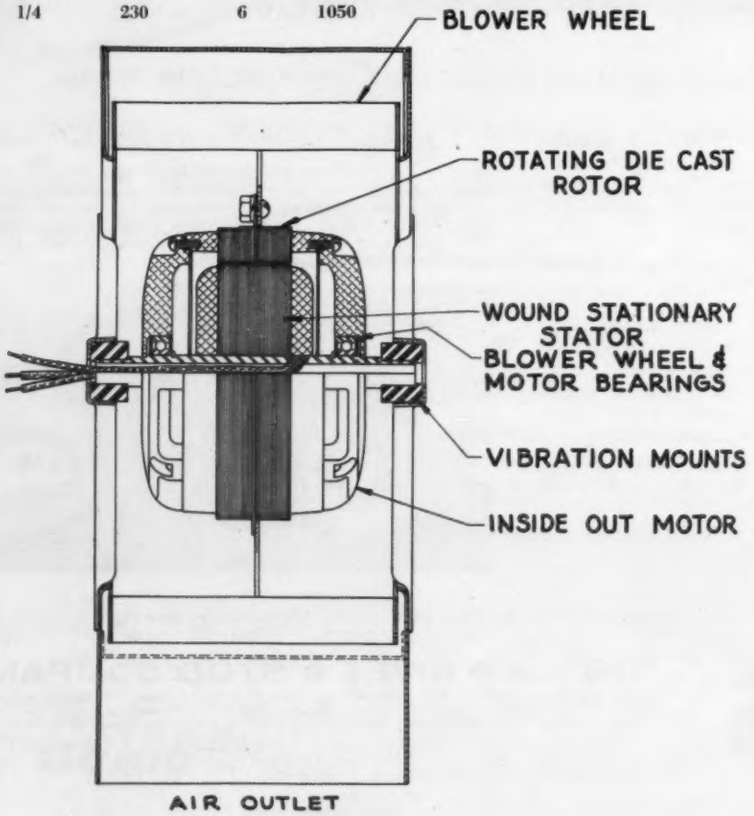
An inside-out, permanent split, capacitor-type motor, in which the stator is on the inside and the rotor is on the outside, provides special advantages when used to drive a squirrel-cage blower. This type of motor offers high efficiency with low operating-power requirements. Apparent advantages in this new design are: elimination of belts, pulleys and external motor mounts for more compact blower dimension possibilities; exclusion of internal starting switch; and use of two bearings as compared with four on conventional belt-driven blowers. Clear air intake openings without motor blockage provide an even air discharge pattern that eliminates hot spots. It is claimed that the low in-rush current of this motor, approximately half that of a comparable capacitor start motor, eliminates draw on the power lines and extends fan control life.



A. O. Smith Corp., Electric Motor Div., Tipp City, Ohio.

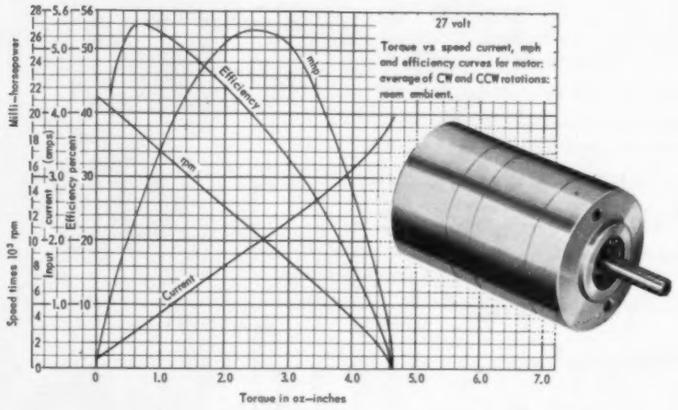
INSIDE-OUT MOTOR is currently built in following ratings:

HP	*Voltage*	*Pole*	*RPM*
1/4	115	6	1050
1/4	230	6	1050



PM D-C Motors 302

Operates from 6 to 115V D-C



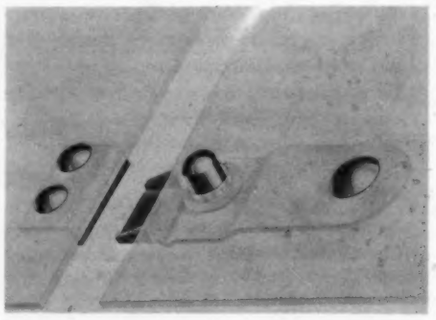
Permanent-magnet, fhp motors, designed to meet military requirements, measure 1 inch in dia, offer high efficiency and are built to the same standards as the larger series of the manufacturer's motors. Three lengths are available and the motor can be supplied for use on any voltage from 6 to 115v d-c. Square brushes, retained by a constant-pressure spring, insure long brush life. Rotary components have an explosionproof housing and are designed to satisfy environmental requirements of MIL-M-8609 (ASG). As in all PM units, dynamic braking can be employed. A DPDT switch or simple relay circuit is all that is needed to bring the armature to rest in a few revolutions. Typical characteristics for a 27v motor are: duty cycle, 4 minutes on, 6 minutes off; torque, 1.0 oz-in; rpm, 17,000, and current rating, 0.85 amp.

Barber-Colman Co., Dept. 2411, Motors & Components Div., Rockford, Ill.

Pushbutton Fastener 303

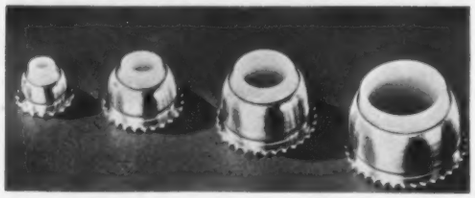
Offers Quick Release for Lift-Off Covers

This low-cost quick-release holddown is mounted to inside of cabinet by rivets or can be welded. Only a small pushbutton is visible on outside of closure. Operation is simple—press button in, lift cover to open; shut for automatic and positive latching. Measuring only 3/4 inch in width and 2-1/2 inches in length, holddowns are made with either 90- or 180-deg keeper mounting. Installation is easy. Keeper and release button are steel, cadmium plated. Spring is steel, lubrite. Welding nib (where used) is steel, copper plated. Holddowns are useful for installations where quick accessibility is essential without the need for protection from tampering.



Southco Div., South Chester Corp., Lester, Pa.

Self-Aligning Bearing 304



Self-aligning to 5 deg off center line around the full 360 deg, this unit retains and aligns itself in sheet metal of 0.040 inch or heavier stock. Bearings are of du Pont "Delrin". Retainers are steel, aluminum or stainless steel. Aluminum type may be mounted in materials of Rockwell hardness of B-50 or less; steel types B-70 or less. Assemblies are designed to center in a prepared hole, clinch securely and resist torque. Assemblies may be removed by a press and a new bearing installed. The unit is available in shaft sizes from 1/32 to 1/4 inch.

Spyraflo, Inc., subsidiary of Penn Engineering & Mfg. Corp., Drawer "E", Miami 64, Fla.

Clip-On Fastener 305



For many applications, the Type LHA4972 fastener economically can replace fixed and floating anchor or plate nuts—completely eliminating the cost of riveting and riveting tools. It can be used effectively also for many types of sheet-metal or fiber-glass assemblies for missile and electronic end-use as long as the 0.020-inch thickness of clip can be tolerated between mating surfaces. Cost of riveting is eliminated and ease of removal or replacement is an advantage. An important feature of the new design is a locating eyelet formed on the base plate which snaps firmly into hole drilled or punched in sheet. Shape of the eyelet and spring tension of clip design insure that the fastener will not shake loose from assembly during transportation in the shop and prior to insertion of screw. The unit is manufactured from carbon steel; available inventory size 10-32, other sizes in design. Locking torque and tensile meet MIL-N-25027 specifications.

Elastic Stop Nut Corp. of America, 2330 Vauxhall Rd., Union, N. J.

EVEN DOUBLE THE THICKNESS:

Fairmont Stainless Clad Aluminum sheet gives you FASTEST, MOST UNIFORM HEAT TRANSFER



Fairmont Stainless Clad Aluminum **.100 THICK**

Copper Core Stainless **.050 THICK**

Carbon Core Stainless **.050 THICK**

After five minutes at maximum distance from controlled heat source, pan made of Fairmont Stainless Clad Aluminum, even though double thick, shows 290° F at side wall—in comparison with 230° F for copper core pan and 120° F for carbon core pan. Utensils furnished by courtesy of Vita Craft Manufacturing Company. The testing devices courtesy, Leeds & Northrup.

LIGHTEST WEIGHT, WITH STRENGTH



Fairmont Stainless Clad Aluminum **.100 THICK**

Copper Core Stainless **.050 THICK**

Carbon Core Stainless **.050 THICK**

Although twice as thick and correspondingly strong, the Stainless Clad Aluminum pan weighs up to ⅓ less than the copper core or carbon core pans. This means lower shipping costs. Also, increased sales appeal to Mrs. Homemaker, who will simply love a sturdy pan that's nevertheless easy to lift.





WHAT'S YOUR NEED FOR THIS MAGIC METAL?

2 plus 2 equal 4. And Fairmont Stainless Clad Aluminum—with its unique combination of the strength and corrosion resistance of stainless steel permanently bonded to the light weight, good conductivity of aluminum—adds up to a bonanza in business-building product improvements. In many fields. From pots and pans to appliance and automotive trim, to architectural components. Whatever your line, the above has given you ideas. Let us help you with them. Write for further information. Or phone your local Fairmont office for a Fairmont field engineer.

FAIRMONT ALUMINUM COMPANY

SUBSIDIARY OF **CERRO CORPORATION**

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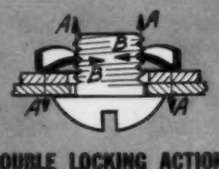
Here's what Quality-Controlled

PALNUT® LOCK NUTS

can do for **your** assemblies!



PALNUT Lock Nuts are single-thread lock nuts made of spring-tempered steel, with coned, notched thread-engaging center formed to fit screw threads accurately. Perfect hex shape, straight sides, ample height for easy, speedy wrenching. Regular type, shown above, illustrates locking action of all PALNUTS.



DOUBLE LOCKING ACTION
When PALNUT Lock Nuts are tightened, powerful spring forces (A-A) are exerted upward on the screw threads and downward on the part. Spring forces (B-B) are exerted inward, to grip the threads like a chuck.

- **REDUCE COSTS.** PALNUT Lock Nuts are precision-produced in huge volume at very low cost—priced less than other locking methods, often less than plain nuts.
- **REDUCE PARTS.** A single PALNUT can replace an ordinary nut, lock-washer, flat washer and sealer washer according to type used.
- **SPEED UP ASSEMBLY.** PALNUTS apply easily and fast with ordinary manual or power tools—extra fast with PALNUT Magnetic Wrenches. No auxiliary fastener parts to handle.
- **HOLD SECURELY.** PALNUTS exert a resilient, double-locking action that holds tight under severest vibration.
- **SAVE SPACE.** Most PALNUTS require less space than other fasteners and save additional space by eliminating lock-washers and flat washers.
- **SAVE WEIGHT.** PALNUTS save 65% of the weight of ordinary nuts, 80% of nut and lockwasher, 85% of nut, lock-washer and flat washer.

WRITE for detailed catalog giving engineering data, dimensions, load ratings, installations of all types of PALNUT Lock Nuts. Describe application for free samples. Call in a PALNUT fastening engineer for discussion.



THE PALNUT COMPANY
DIVISION OF UNITED-CARR FASTENER CORPORATION
18 Glen Road, Mountainside, N. J.
Canada: P. L. Robertson Mfg. Co., Ltd., Milton, Ont.

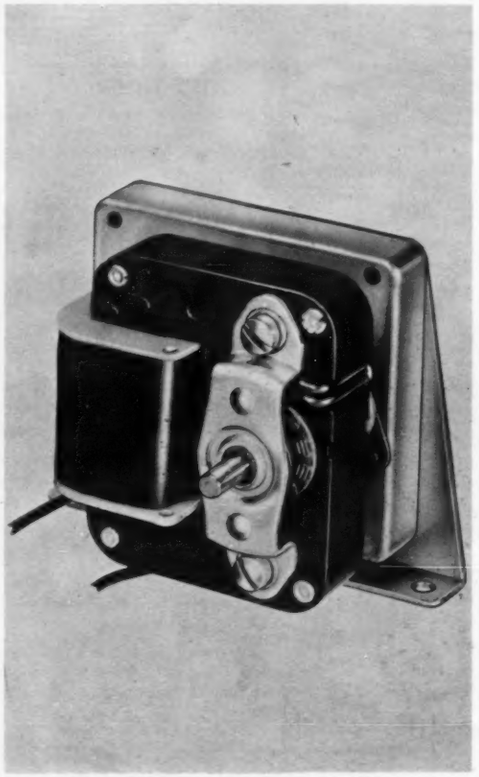
PALNUT® LOCK NUTS
for quick, secure fastening at low cost



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FHP Gearmotor 306

The clutch of this rotary component disengages rotor pinion from remainder of gear train when unit is de-energized to prevent coasting of output shaft. Type HGM fractional-horsepower gearmotor also provides freewheeling gear train so that output shaft may be turned manually when power is off. Extremely low noise level is said to be obtained in motors without clutch, through use of special nylon helical rotor pinion and first gear. Motor specifications are: two-pole shaded pole, a-c induction motor, available in voltages ranging from 6 to 220v, 50 or 60 cycles. Cooling



fan is available for continuous-duty applications. Self-aligning porous-bronze bearing with felt oil reservoir offers lifetime lubrication. Field coil can be furnished with solder terminals or leads. Quick-disconnect terminals are obtainable. Output speeds range from 1 to 800 rpm; output torque ranges to 50 lb-in at 1 rpm. Output-shaft diameters are 3/16, 1/4, 5/16 and 3/8 inch; shafts may be extended from either or both sides of gear reducer.

Molon Motor & Coil Corp., 3737 Industrial Ave., Rolling Meadows, Ill.



VALUE ANALYSIS REVEALS SPECIAL ADVANTAGES OF INTEGRALLY BUILT-IN PUMPS

► Designers of machines employing lubricating pumps or low-pressure hydraulic systems can now achieve more compact design and reduced costs by integrating three matched Gerotor pump components directly into their mechanism. This space-saving innovation is now widely specified for machine tool, automotive, aircraft and other fluid systems.



Fig. 1. Three Gerotor components permit pump to be incorporated as integral part of housing or frame of mechanism, eliminate need for purchase and mounting of separate, complete pump.

► A three-piece insert package makes this economical pump integration possible. Consisting of an inner and outer Gerotor and an eccentric locator-ring, the unit becomes a complete pump by simply boring the casting or frame of the mechanism to accommodate the locator ring O.D. and by providing porting. This design makes the main casting do double duty as the pump housing, thus eliminating a very considerable cost factor. A drive can be taken from any convenient shaft. A simple, positive-acting automatic reversing feature can be built in at little cost.

► The Gerotor is a form of internal gear pump consisting of only two moving parts: an inner toothed element and an outer, meshing toothed element. The inner element has one less tooth than the outer and the "missing tooth" provides a chamber to move the fluid from the inlet port to the outlet. (See Figure 2). Pump capacity is measured by the volume of the "missing tooth" multiplied by the number of driver teeth and RPM.

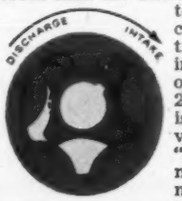


FIG. 2

► The designer thus has the advantage of several variables to secure a given capacity within his space limitations: *Gerotor diameter* — which governs the area of the pumping chamber — *Gerotor thickness* which, taken with area, determines chamber volume — *Gerotor RPM*, since this is a positive displacement pump. Thus, it is possible to vary the diameter, the length and the speed of the pump within certain overall limits to secure the wanted capacity.

W. H. NICHOLS CO.

Makers of Zenith Metering Pumps and the Nichols Milling Machine "the miller that uses its head".

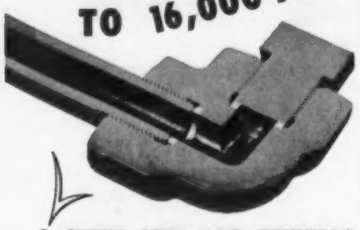
48 WOERD AVE., WALTHAM 54, MASS.

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COMPONENTRY BY

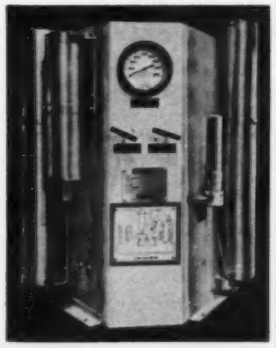
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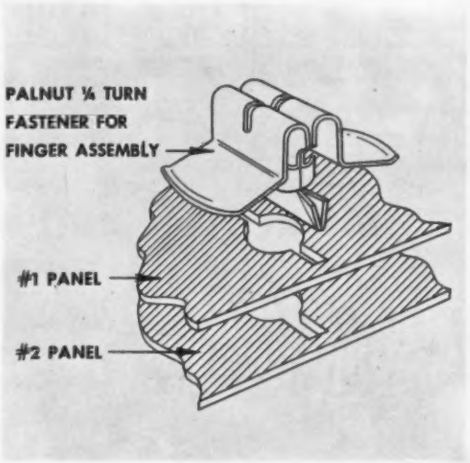


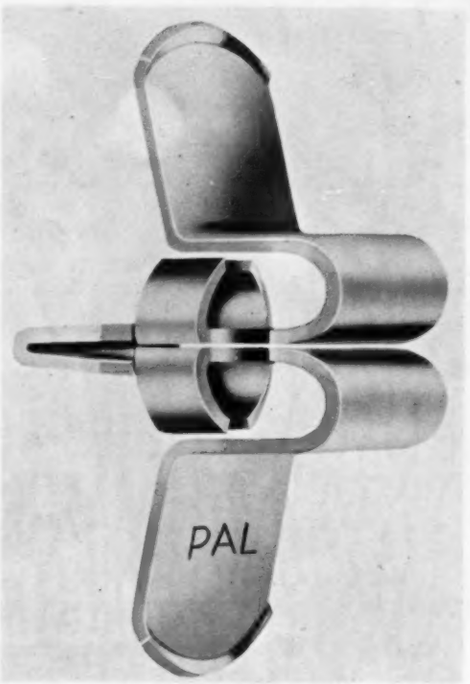
° *Write for Catalog Today!*

PRESSURE COMPONENTS, Inc.
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GLENDALE 8, CALIFORNIA

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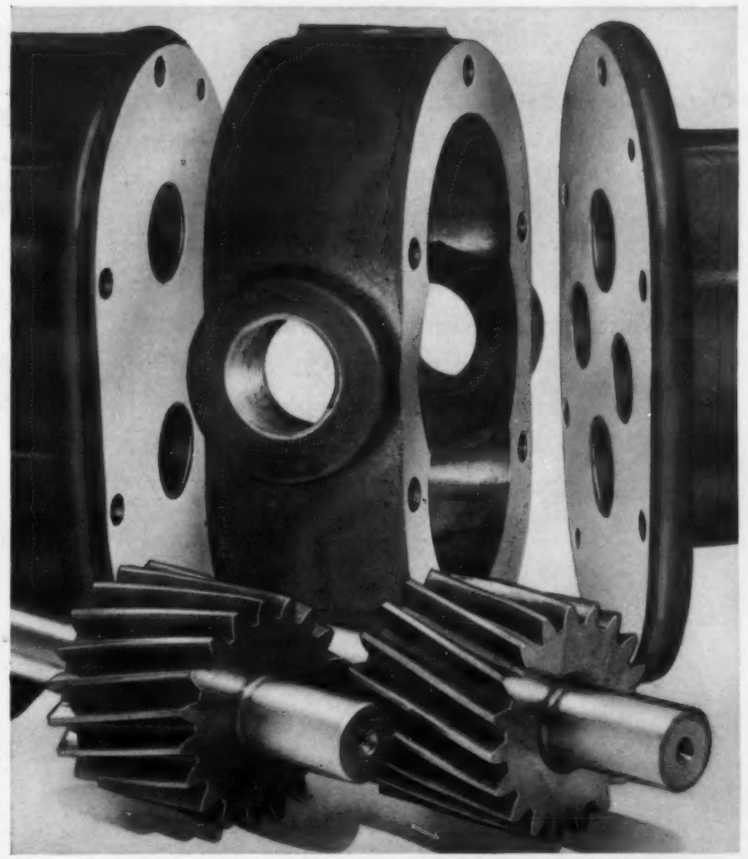
1/4-Turn Fastener 307





Low in cost and consisting of only one piece, a lightweight spring-steel quarter-turn fastener provides rapid and simplified assembly and disassembly for blind fastening applications. Fastener is inserted into prepared holes in panels, then locked and unlocked by pressing firmly with fingers and rotating 90 deg in either direction. Part No. QA50080 is self-retaining in outer panel, avoiding displacement when assembly is opened. A barrel shank keeps fastener centered in hole and adds shear resistance. Working samples are available.

Palnut Co., Div. of United-Carr Fastener Corp., 61 Glen Rd., Mountainside, N. J.



Why we bother to grind these parts for Brown & Sharpe Pumps

Sure we could settle for tolerances of .001" and still make good pumps. But by precision grinding, 90% of our gears, shafts, and housing faces are within .0005" to give you *better* suction lift, *reduced* slippage, and *longer* pump life.

You can even see the difference by simply comparing the surface finish on the gears, shafts, and housing faces of a B&S pump with pumps made by most other manufacturers.

Try it! You'll see why B&S pumps are extra-dependable . . . they go right on pumping when other pumps have quit. Write for details to Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

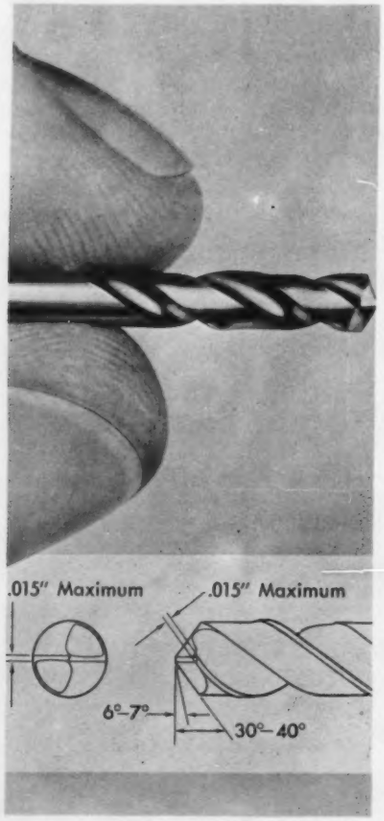


Extra-dependable B&S rotary gear pumps are used in every major industry. Pressures: to 1000 psi — Capacities: to 175 gpm — Viscosities: 50 to 50,000 ssu.

Brown & Sharpe
PRECISION CENTER

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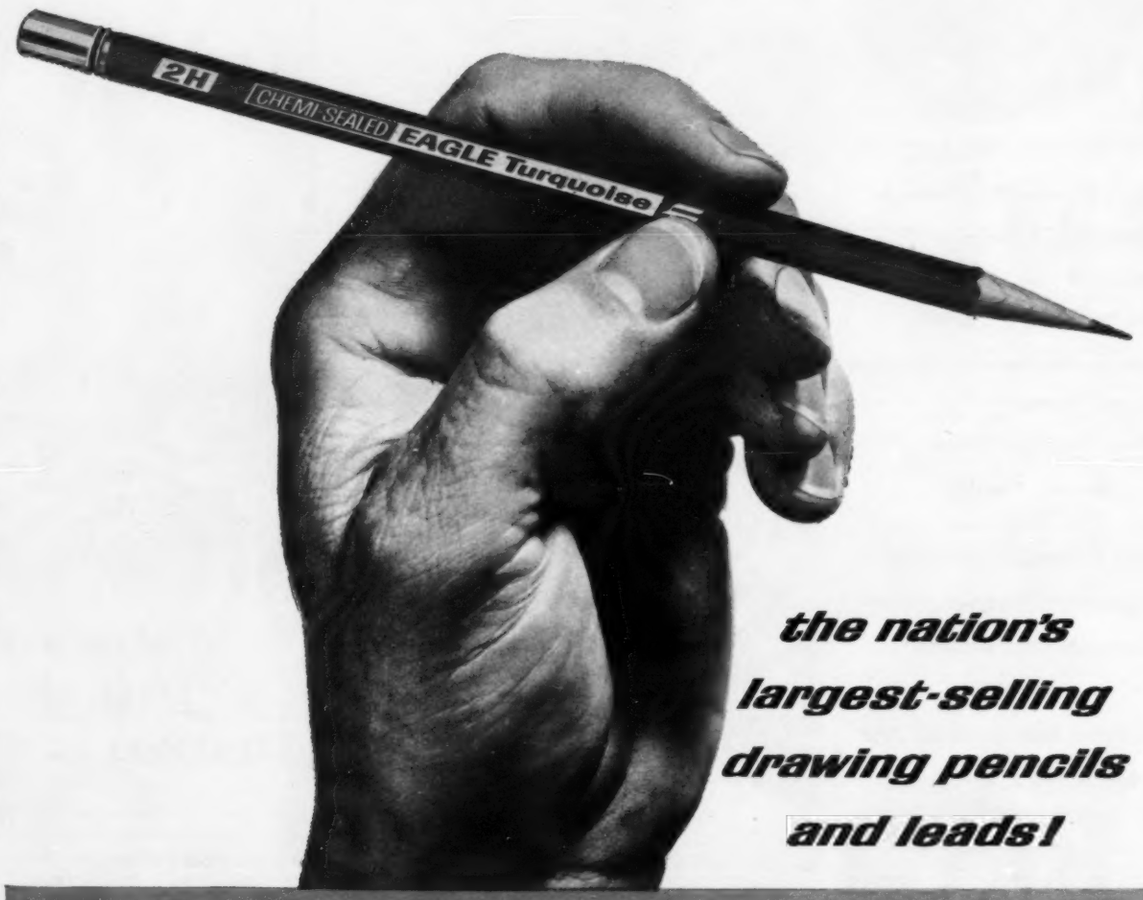
Circuit-Board Drills 308



Stack drilling of printed-circuit boards on various high-production type machines is an application of this new standard line of solid-carbide drills. Series 362-N offers a 118-120-deg included-point angle—with primary and secondary lip-relief angles of 6-7 and 30-40 deg, respectively. These factors, plus the drills' 0.015-inch maximum webb at point, combine to permit fast, accurate drilling of smooth, burr-free holes in both epoxy and phenolic laminates. All drills in this line are finished with highly-polished flutes and strong, sharp edges to assure a faster and cleaner cutting action. Drills may be obtained in standard wire sizes ranging from No. 1 through 72 inclusive and also in fractional sizes from 1/4 down to 1/32 inch in steps of 1/64 inch.

Ace Drill Corp., Adrian, Mich.

COMPLETELY NEW... IMPROVED EAGLE



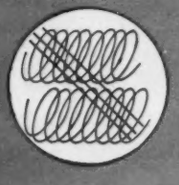
the nation's largest-selling drawing pencils and leads!



IMPROVED
POINT STRENGTH
New TURQUOISE has a finer (and therefore stronger) structure that takes a needle point and holds it under drawing pressures for long lines of unchanging width. Sharpened to a fine point the new, improved Eagle TURQUOISE gives you 16 to 24% stronger points.



IMPROVED
DURABILITY
Because the more compact lead structure of the new Eagle TURQUOISE gives off no large chunks of useless "dust" to blow away, TURQUOISE, grade for grade, wears down more slowly. Wear tests show the new, improved Eagle TURQUOISE 32 to 68% more durable.



IMPROVED
SMOOTHNESS
New TURQUOISE leads have a low friction, smooth-gliding quality never approached before. No harsh impurities to change your line or tear the paper. The new, improved Eagle TURQUOISE is up to 31% smoother.



IMPROVED
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Because 100% "Electronic" graphite deposits more particles more evenly on paper, new TURQUOISE, grade for grade, is demonstrably blacker and more opaque. Turquoise is unsurpassed for perfect reproduction. You'll see the proof in the print yourself.

TURQUOISE®

NOW...PACKAGED IN HANDSOME AND PRACTICAL SOLID STYRENE BOXES

new, improved
Eagle Turquoise pencils in
elegant, hinged cover box



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NOW AT YOUR DEALERS IN UNIFORM GRADES FROM 6B THROUGH 9H

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Please send me the FREE EAGLE TURQUOISE SAMPLER that contains 2 new Eagle TURQUOISE PENCILS and 2 new Eagle TURQUOISE LEADS.

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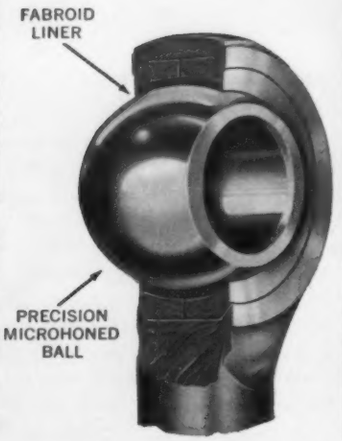
FHP A-C Gearmotor 309

Hysteresis synchronous and low-slip induction gearmotors may be manufactured to customer specifications and requirements with a torque range to 300 oz-in at 1 rpm in the induction type, and with frame diameters of 2 inches in the synchronous type. Induction types are available in either the 1-3/4 or 2-inch-dia frames. The hysteresis synchronous unit overcomes objectionable conditions where speeds can fluctuate because of sudden variations in line voltage or in load. Shaft oscillation virtually has been eliminated, providing continuous and smooth operation of the application equipment within the limits



of the backlash selected. Lengths of units vary from 3-1/4 to 6 inches, depending on application specification. Shaft is supplied to customer requirements. Motors feature hardened stainless-steel gears and pinions to provide improved power transmission capacity. Motor and gear housings are corrosion-proof durable aluminum, cast around laminations. Die-cast end bells are rabbetted to frame.

Ashland Electric Products, Inc., Dept. DN, 32-02 Queens Blvd., Long Island City 1, N.Y.



BEARINGS YOU NEVER LUBRICATE

Typical Fabroid Self-aligning Bearing



Typical Fabroid Journal Bearing

®FABROID BEARINGS CUT FRICTION 90%

Under severe helicopter test conditions, Fabroid bearings have gone 60,000,000 cycles *without* failure where all other bearings have failed at 50,000 cycles or less. In actual use Fabroid bearings are performing equally well. Yet Fabroid bearings *never* need lubrication!

Fabroid is a combined fabric of glass and Teflon* fibers backed by glass cloth impregnated with phenolic. The glass-phenolic system acts as a honeycomb which traps the Teflon and prevents it from cold flowing. The result is a bearing with 1/10th the friction coefficient of lubricated metal bearings.

Fabroid has limitless bearing applications where any or all the following conditions exist: lubrication is impractical; extreme temperatures; tight space or weight conditions; abrading, galling or corrosion; contamination; static friction; shock vibration.

**E. I. Dupont's Tetrafluorethylene*

SEND FOR this informative brochure which fully describes the functional characteristics of Fabroid.



MICRO-PRECISION DIVISION
OF
MICROMATIC HONE CORPORATION

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Auxiliary Governor **310**

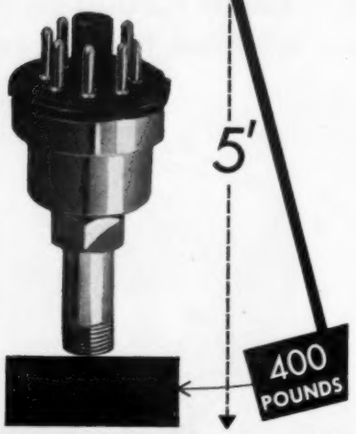


A practical control to automatically adjust power supply to keep power takeoff speed constant has been developed for power equipment—offering a wide variation in load requirements. The device will provide protection for costly hydraulic pumps and will help lower maintenance costs and increase efficiency of equipment. The manufacturer states that the protection factor tends to decrease downtime for field crews while repairs or replacements are being made on components driven by power takeoffs. The unit can be adapted to control the speed of any hydraulic or mechanical device. The system operates from a driven unit mounted on the power takeoff, and automatically adjusts the throttle to maintain specified speed of the work tool with every change in load. The auxiliary governor must be custom-fitted to the vehicle and equipment to meet exact requirements of the user. It has been designed to operate in conjunction with the engine-speed governor as calibrated by the engine manufacturer. On applications where no engine speed-governor is integral with the carburetor, a sandwich-type governor is installed between carburetor and manifold.

Holley Carburetor Co., 11955 E. Nine Mile Rd., Warren, Mich.

HASTINGS VACUUM GAUGES

Use Ruggedized Gauge Tubes



RUGGED **HASTINGS GAUGE TUBE UNHARMED** FROM SHOCK IN 400 LB. DROP HAMMER TEST

Ruggedness is *defined as* "strong, sturdy, hardy". But ruggedness is *demonstrated* by this shock test of a Hastings Gauge Tube conducted to government specification MIL 901B. A 400 lb. drop hammer was released to apply shocks to the above pictured Gauge Tube in all three planes from 1, 3 and 5 feet. The Hastings Gauge Tube remained unharmed and fully operable.

For every application where ruggedness, plus sensitivity, is needed in the measurement of vacuum, Hastings gauges offer advantages not found in other vacuum gauges. Their special patented heated thermopile construction, compensated for temperature and rate of change of temperature, offers rapid and accurate response. Hastings direct reading gauges, free from tube burn-out or glass breakage, are available in four hard-to-measure ranges, 0-100μ Hg; 0-1000μ Hg; 0-200mm Hg and 10-200mm Hg.

Send for Free Catalog No. 175 for more information on Hastings Vacuum Gauges, Controllers, Recorders.

HASTINGS-RAYDIST, Inc.
Hampton, Virginia PArk 3-6531

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*PROTOTYPE DIE CASTING SERVICE

What Is PDCS?

Prototype Die Casting Service is a new process which allows the low cost creation of die castings . . . in small quantities . . . which look, feel, finish and perform remarkably like production die castings.

Why Was PDCS Developed?

Over a year and a half of intensive research and test was devoted to the development of PDCS to provide a method of supplying sample die castings for test purposes . . . without the problem of underwriting permanent tooling charges.

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If part of the product you are planning is to be a die casting and you need prototype die castings to . . . supply your customers with samples . . . test the function of the completed assembly . . . gauge sales appeal by market-testing . . . judge the "feel" or appearance of the die casting . . . PDCS represents the answer you have been looking for.

How Much Does PDCS Cost?

Amazingly little. The factors of shape, size, complexity and quantity all play a part in determining price.

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If you have prints, models, sketches or just an idea of what you need in a die casting . . . we are ready to help. Just fill out the coupon . . . clip and mail today.

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West Haven, Conn.

NEWTON NEW HAVEN

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I have a problem to which PDCS may be the answer. Without cost to me or my company . . .

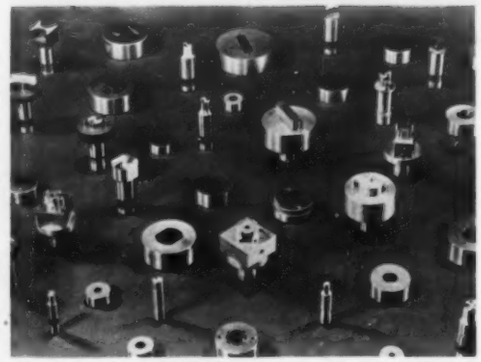
☐ Prints ☐ Models ☐ Sketches are being forwarded under separate cover. Please submit your cost estimate.
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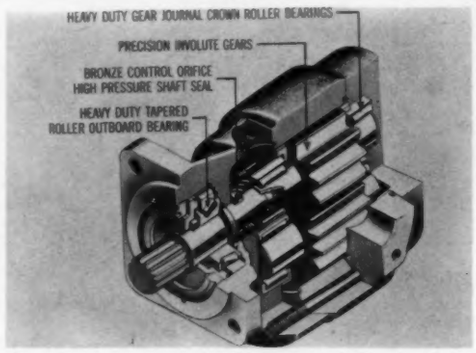
Special-Purpose Punches and Dies 311



An expanded line of punches and dies is offered for electrical and electronic punching in over 110 sizes. Included are D and double-D shapes, hexagon cutouts, electrical outlet knockout, keyhole, 7 and 9-pin tube base, receptacle, keyway, tab, trim and cutoff, and corner-rounding systems. Three- and four-section lytic, IF condenser and cable-opening punches and dies are also available. Units are offered in round, square, rectangular and oval styles. Cutting edges are ground with a high degree of concentricity. Punch point is concentric to shank within 0.0005 inch.

Di-Acro Corp., 528 Eighth Ave., Lake City, Minn.

2500-PSI Gear Pump 312



Outputs ranging from 7 to 97 gpm at 1800 rpm at continuous-duty operation are features of this heavy-duty pump line. Complete redesign of the tooth contour of drive and driven gears permits pump to operate with greater discharge per inch of gear width. All three series—25, 37 and 65—are recommended for continuous-duty operation. Series 25 has a delivery range of 7 to 35 gpm; this series is available with gear widths of 1/2, 1, 1-1/2 and 2 inches. For a delivery range of 11 to 56 gpm, Series 37 is offered in gear widths from 1/2 through 2-1/2 inches. Series 65 has a delivery range of 45 to 97 gpm and is available in gear widths from 1-1/2 through 3-1/4 inches.

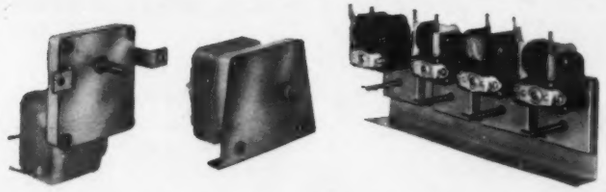
Commercial Shearing & Stamping Co., Youngstown, Ohio.

Molon fractional horsepower Motors

CUSTOM MANUFACTURED TO YOUR SPECIFICATIONS
Insure Better Product Performance



Cost-Saving Mounting Accommodations for Easy Installation



From 1/500 to 1/40 hp., Molon offers a wide range of low-cost fhp motors, standard or special . . . skeleton type or gearmotors. Built-in mounting features cut installation costs. Fast deliveries. Simply send your specs for our recommendations. No obligation. Write today.

Molon Motor & Coil Corp.

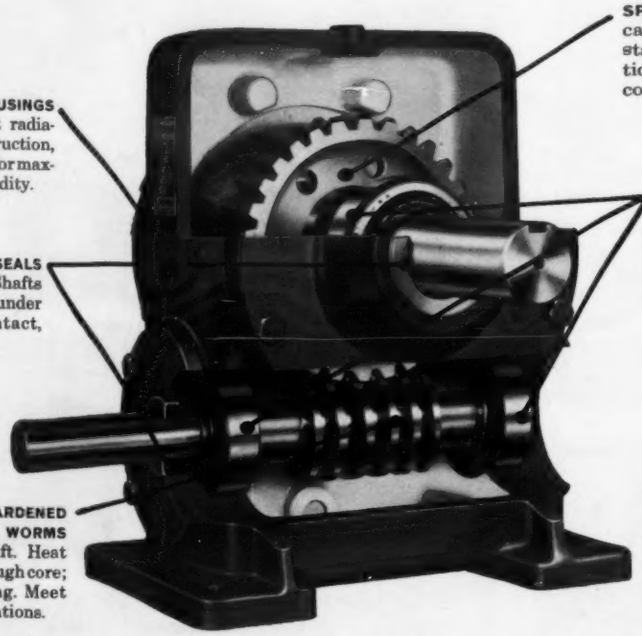
3737 Industrial Avenue • Rolling Meadows, Illinois
Custom Designers and Manufacturers of Sub-Fractional Horsepower Motors and Gear-Reducers

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Engineering Data

WINSMITH SPEED REDUCERS

WINSMITH "C" SERIES WORM GEAR SPEED REDUCERS



SPECIAL BRONZE WORM GEARS cast to recommended AGMA standards. Low coefficients of friction and thermal expansion for cooler, more efficient operation.

CAST IRON HOUSINGS designed for high heat radiation. One-piece construction, close-grained gray iron for maximum strength and rigidity.

TAPERED ROLLER BEARINGS for minimum maintenance, long bearing life, permanent shaft alignment. Capacity to handle high radial and thrust loads.

POSITIVE OIL SEALS keep oil in, dirt out. Shafts lapped to micro-finish under seals for uniform contact, longer seal life.

CASE-HARDENED GROUND STEEL WORMS cut integral with the shaft. Heat treated for close-grained tough core; carburized before grinding. Meet AGMA long-wear specifications.

AVAILABLE in single and double reduction models, for intermittent or continuous service. Order from stock with right-angle or parallel shafts, worm on top or bottom, all worm gear or combined worm and helical. All types of special units also available.

- *108 Models*
- *1/100 to 34 H.P.*
- *Ratios 5:1 to 4460:1*
- *Max. Output Torque 142 to 34,767 in. lbs.*

Winsmith "C" Series Reducers are compact units which offer a wide range of horsepower and torque output in minimum space. Their design and construction provides high shock load resistance; maximum thermal capacity without induced cooling; greater overhung load capacity; all moving parts totally enclosed in a dirt-proof housing and lubricated from a central oil bath; and complete interchangeability of major components. These features add up to smooth, trouble-free performance—an extremely low rate of wear—high mechanical efficiency—and greater overall economy per horsepower dollar.

For complete information on Winsmith Speed Reducers, write today or call your nearest Winsmith Representative. You'll find one in every major industrial area, listed in the Yellow Pages. They are technically trained experts who are always ready to help you with any speed reducer problem. For both standard and special power transmission applications, you'll find it pays to standardize on Winsmith.

WINSMITH, INC.

200 Eaton Street, Springville, (Erie County), New York

MEMBER OF AGMA

• • • Winsmith Speed Reducers are made by American craftsmen to meet American design and production standards.

Circle 50 on Reader-Service Card for more information

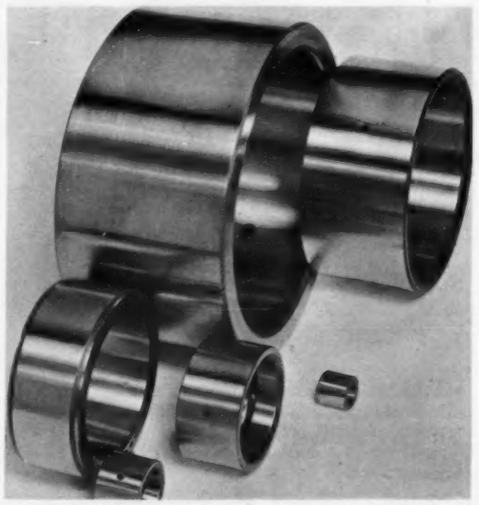
FHP Motors 313



A-C and d-c fractional-horsepower motors are offered in sizes 12 and 15 and are currently available in a wide number of variations. The a-c units are obtainable in all types; d-c configurations include permanent-magnet types as well as series or shunt. Motors may be supplied with options—brake, noise filter, thermal overload or gear box—all qualified to military specifications.

Transco Products, Inc., 12210 Nebraska Ave., Los Angeles 25, Calif.

Precision Spacer Bushings 314



Hardened and ground standard precision steel spacer bushings are offered in sizes ranging from 3/8 to 8 inches ID and 9/16 to 9-1/4 inches OD. Lengths range from 1/2 to 3 inches. Bushings are recommended for spacing components such as gears and for providing smooth hardened sections on shafts and in housings, as guide bushings and surfaces for positioning bearings and seals.

Detroit Ball Bearing Co., 26311 Woodward Ave., Huntington Woods, Mich.

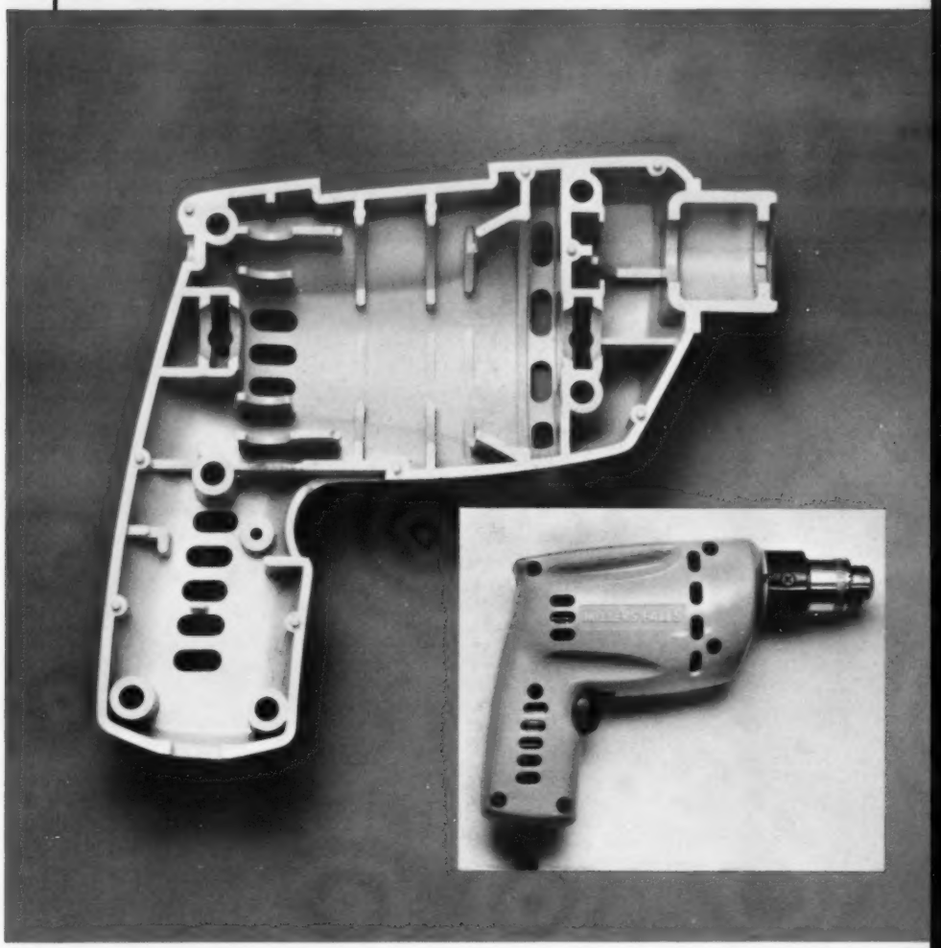
Circle 51 on Reader-Service Card

working with

Du Pont Zytel®

nylon resins

one of Du Pont's versatile engineering materials



New drill housing of ZYTEL® NYLON RESINS insulates ...eliminates costly machining operations

A basic design advance in power tools, this ¼" drill is made with a nonconductive housing of Du Pont ZYTEL nylon resin. Double-insulated, it protects the user against shock hazard. Other design advantages include a weight saving: the housing of ZYTEL is 20% lighter than a comparable housing of aluminum. It is self-extinguishing. It stays comfortable to the touch in hot and cold weather and after prolonged use. It is rugged, durable and impact-resistant.

In addition, the use of ZYTEL affords substantial production advantages. The two halves of the drill housing, though complex in design, are quickly and easily molded. The excellent dimensional stability of ZYTEL assures a perfect match of each half for screw inserts, assembly and flange matings. And the housing requires no machining operations whatever.

Molded by Nylon Products Corp., affiliated with F. J. Kirk Molding Co., Clinton, Massachusetts, for Millers Falls Company, Greenfield, Mass.

On the following page you will find additional examples of practical design improvements made possible by the combination of properties that ZYTEL nylon resins offer.

DU PONT

REG. U.S. PAT. OFF.

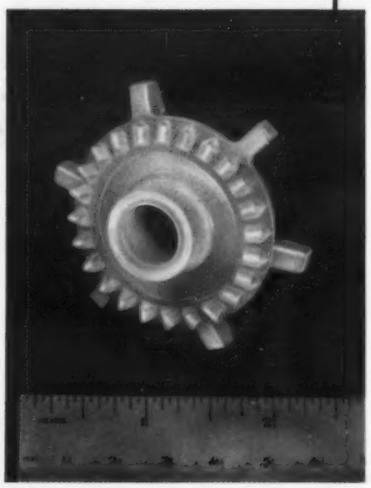
BETTER THINGS FOR BETTER LIVING ...THROUGH CHEMISTRY

working with

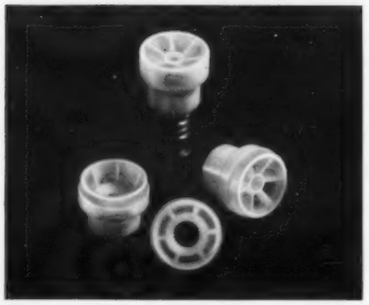
Du Pont Zytel® nylon resins

one of Du Pont's versatile engineering materials

Parts of ZYTEL® NYLON RESINS perform reliably under attack by heat, impact and chemicals



This oil slinger swirls oil onto vital engine parts. It must be tough, resistant to impact, abrasion and attack by oil at high temperatures. ZYTEL provides all these resistant properties and permits economical injection molding of the part. (Molded by Sinko Mfg. & Tool, Chicago, Ill., and Danielson Mfg. Co., Danielson, Conn., for Briggs & Stratton, Milwaukee, Wis.)



These faucet-handle inserts are designed for interference-fit assembly and to act as an insulator against heat. These rugged parts of ZYTEL will withstand 116 inch-pounds torque at the stem between 20° and 160°F. They are expected to give at least 20 years of efficient service. (Molded for American Radiator & Standard Sanitary Corp., New York, New York.)



This compact switch relay uses parts molded of ZYTEL to withstand rugged treatment and yet operate quickly, smoothly and positively. Necessary in this application are good heat resistance, good electrical properties and high strength in thin sections. ZYTEL fills the bill. (Molded by Ritepoint Pen & Pencil Co., for Warco Industries, both of St. Louis, Missouri.)

An important factor in the design versatility of ZYTEL nylon resins is their ability to be molded to accurate tolerances without costly machining. Equally important is the wide variety of ZYTEL nylon resins available to meet special problems. All ZYTEL compositions have the basic properties of low friction, impact and abrasion resistance, high strength and resistance to chemicals.

Du Pont ZYTEL may help you, too, to improve the performance or the economics of a part or product. The coupon below will bring you information relating to your own problem or field of interest.

POLYCHEMICALS DEPARTMENT

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING ... THROUGH CHEMISTRY

E. I. du Pont de Nemours & Co. (Inc.), Dept. 1
Room 2507Z, Nemours Building, Wilmington 98, Delaware.

Please send me: ☐ How 50 Manufacturers Used ZYTEL® Nylon Resins to Make Better Products
☐ Designing with ZYTEL®

I am interested in evaluating ZYTEL for_____

Name_____ Position_____

Company_____

Street Address_____

City_____ Zone____ State_____

Type of Business_____

ZYTEL® *nylon resins*

Alathon® · Delrin® · Lucite®

Miniature Carbide Drills 315



Precision-ground, miniature, solid-carbide boring tools offer precision jig boring of small, close-tolerance holes and are available in seven miniature sizes to permit boring from 0.020 to 0.080-inch dias. All tools offer added rigidity and all top rake and relief angles are lapped to mirror-like finishes. Field tests have proven these tools invaluable for machining of components for aircraft instruments, gyro gimbals and other miniature equipment.

Atrax Co., 240 Day St., Newington, Conn.

Circle 51 on Reader-Service Card



Compact, Dependable, Quiet and Powerful——



that's what The Pfaudler Co. demands of gear reducers used for the agitator drives on their glassed-steel and alloy mixing vessels. That's why Pfaudler specifies Cone-Drive double-enveloping worm gear reducers for their line of TW Agitation Drives.

Cone-Drive gear reducers are available in capacities up to 60 HP and with 27 standard output speeds from 7.3 to 525 rpm (with 1750 rpm motor). Gear reducers can be hollow-shaft or solid shaft for left-hand, right-hand or vertical mounting.

Hollow-shaft gear reducer shown in the application above has a 5″ center distance and 30 HP maximum rating. Fan cooled models are available for increased thermal capacity. If maximum thermal HP capacity is required (equal to full mechanical HP ratings), water cooling coils may be installed.

CONE-DRIVE GEARS DIVISION MICHIGAN TOOL COMPANY

7171 E. McNichols Road • Detroit 12, Michigan • *Telephone* TWinbrook 1-3111

Circle 52 on Reader-Service Card for more information

Special Motors are Standard

AT PEERLESS ELECTRIC!

Need a special motor? Our knowledge may aid in reducing the engineering time. We are the exclusive supplier to many manufacturers for motors with unusual operating conditions and duty requirements. Write us your needs!



DRIP-PROOF (open type)

Completely protected against dripping liquids and falling particles.



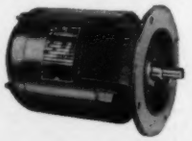
TEPC and EXPLOSION-PROOF

External fan draws cool air across motor toward driven machine.



DIRECT CURRENT

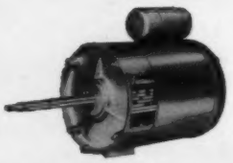
High starting torque, good overload capacity and high electrical efficiency. For rough usage.



WEATHER-TIGHT SPECIAL FLANGE



EXPLOSION-PROOF TORQUE MOTOR WITH BRAKE



SPECIAL FLANGE REVERSING HOIST MOTOR, SINGLE PHASE

ENGINEERING DATA: Special mountings. Various modifications—special shaft features; paint and varnish treatments, Class A, B, F, H insulation. Peerless builds to standards and specifications of JIC, AIEE (including AIEE No. 45 Marine Duty), ABS, Federal and Military.

WRITE FOR BULLETINS: Space-Saver, SP-1; Torque, T-1; Complete Line, SDA-155. *Peerless Electric Division, H. K. Porter Company, Inc., W. Market Street, Warren, Ohio.*

PEERLESS ELECTRIC DIVISION

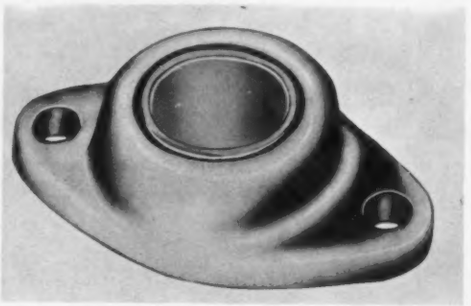
PORTER

H. K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.

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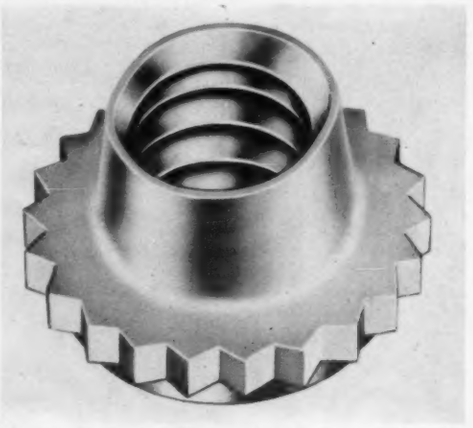
Self-Aligning Bearing 316



"Lube-Align" consists of a one-piece, integrally cast, spherical, self-lubricating, bronze bearing nested in an aluminum housing. This design offers an increased oil supply and eliminates necessity of oil cups or grease fittings. The unit also features total contact support for the self-aligning bearing, making it possible to use miniature-sized units with smaller OD shafting to carry increased loads.

Bronze Bearings, Inc., 3553 W. Addison St., Chicago 18, Ill.

Miniature Fastener 317



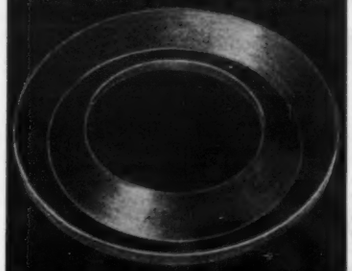
Small, light in weight, self-clinching and self-locking, this stainless fastener is designed for installation in sheets 0.040 inch in thickness and up. The fastener features high push-out and torque values and is flush on reverse side of sheet. Suitable for temperatures to 800F, the unit may be used in materials with Rockwell hardness B-75 or less. Class 3-B threads are coated with dry-film lubricant. Available sizes are No. 4 to 10.

Penn Engineering & Mfg. Corp., Doylestown, Pa.

NOT JUST PACKINGS!

SPECIFY CHICAGO-ALLIS

FOR EXAMPLE VEE PACKINGS



- LEATHER—Wide variety of leathers and impregnants to accommodate a wide range of temperatures, pressures, and mediums.
- HOMOGENEOUS RUBBER—Natural and synthetic rubbers—especially compounded and processed for specific applications.
- COMPOSITION—Includes cotton and asbestos duck impregnated with synthetic rubbers, especially processed for type of fluid or medium and temperature and pressure conditions.

All Chicago-Allis packings are available with *anti-friction* impregnations or coatings.

Whether it is a problem of higher pressures, higher temperatures, extreme operating conditions, or unusual compounds or liquids . . . or just a matter of plain efficiency, economy, and dependability . . . there is a Chicago-Allis packing especially suited for the application. C-A products are used across industry . . . automotive, aircraft, home appliances, agricultural equipment, machine tools, and ordnance equipment. Just ask for the assistance of C-A engineers who are always available for counsel on your packing requirements.



FREE! New 16 page Packing Handbook WRITE FOR IT TODAY!

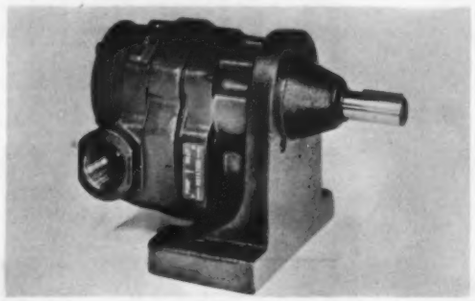
CHICAGO-ALLIS

MFG. CORP.

129 N. GREEN ST. CHICAGO 7, ILL.

Circle 54 on Reader-Service Card

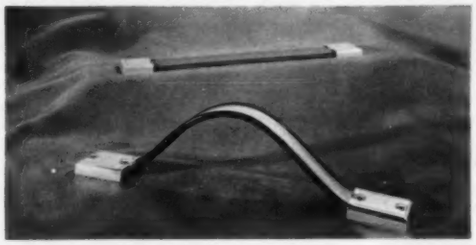
Hydraulic Pump and Motor 318



A combination pump and motor offers reversibility by utilizing a drive shaft, mechanical seal and foot-mount assembly, positioned by the user at either end of the unit. Only eight fasteners must be removed and replaced to reverse the unit. Because of this interchangeability, the unit may be used either as a pump or a motor to give either clockwise or counterclockwise rotation as may be desired. Identified as the 4JDM-1, the component delivers or may be operated at speeds up to 2400 rpm and pressures up to 2000 psi. With this available pressure, full-rated performance from product pumps is obtained with capacities up to 65 gpm. The device may be used in both single or dual product systems.

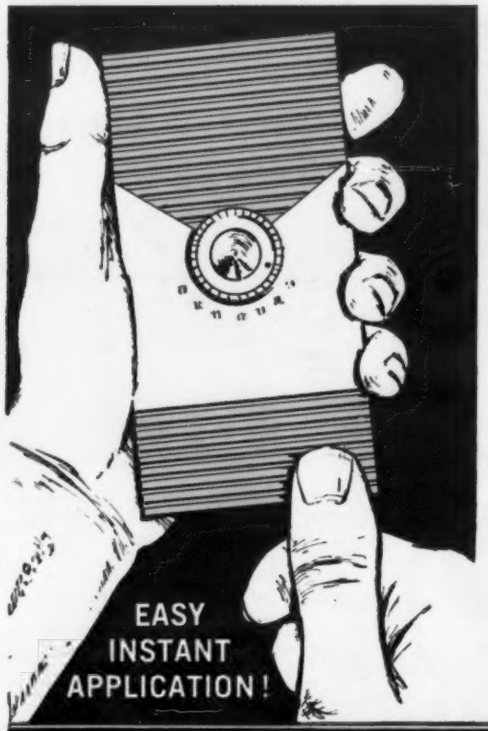
Ardmore Products, Northbrook, Ill.

Vinyl Handle Assemblies 319



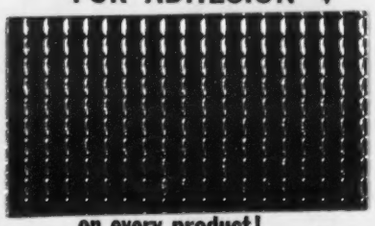
"Mylar"-protected gold- or silver-colored inserts are laminated to a new series of vinyl handles. The low-priced units are suitable for attachment to a variety of lightweight portables, such as fans, corrugated boxes, tool chests and small instruments. Hardware of steel or brass, in any of 12 finishes, fastens by means of prongs which are bent on the undersurface of mounting area. Lengths of almost any size are available, with a simulated-leather texture instead of the insert. This leather-like version is produced in 13 standard colors. Precise color match may be specified for 5000 or more assemblies. A random-selected handle assembly test-lifted a load of 24 lb for 56,000 times without developing signs of wear. This equals four years of extra-heavy use—lifting 24 lb at the rate of 45 times per day.

Philadelphia Handle Co., 1643 Haddon Ave., Camden 3, N. J.



26
EMBOSSED DESIGNS IN 6 METALLIC COLORS...

BACK PEELS OFF FOR ADHESION ▼



on every product!

Choose from the largest variety of laminations, gauges and special effects in the field. Available in continuous rolls, cut-to-size sheets, die cuts or in widths as narrow as 1/4 inch.

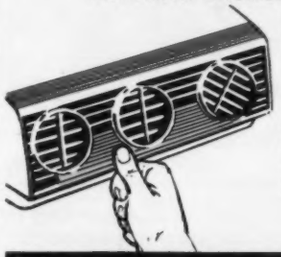
Our design engineering department will assist you in selection and application to meet your individual needs. No cost or obligation.

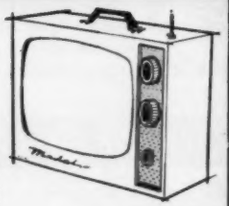
ALL FABRICATION DONE BY US EVERY STEP OF THE WAY

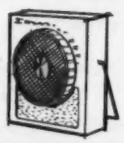
Every process in the fabrication of Mirro-Brite Mylar is done in our own factories... metalizing, coating, embossing, slitting and lamination. This insures uniform quality control plus significant savings to you.

PRESSURE SENSITIVE MIRRO-BRITE IN MADE WITH "MYLAR"* ROLLS SHEETS STRIPS DIE CUTS

***Ready Strip**
ADHESIVE BACKED MYLAR PARTS

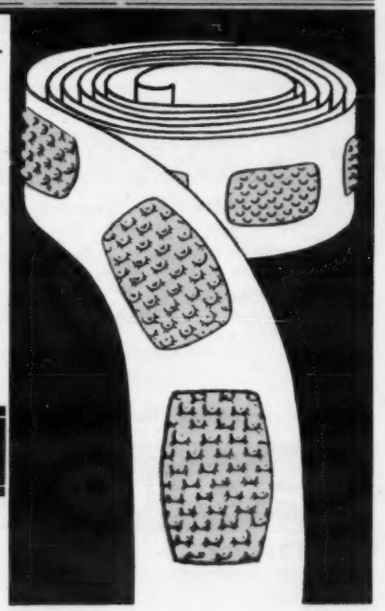






Decorative metalized trims pre-cut to your exact size and shape in continuous rolls. Peel off and press on! A big time saver on your production line.

WRITE FOR FREE SAMPLER BROCHURE



COATING PRODUCTS, INC.

101 WEST FOREST AVE. ENGLEWOOD, N.J.
NEW JERSEY: LOwell 8-0610 NEW YORK: WIsconsin 7-4435

*A DuPont Polyester film

"PIONEERS IN METALIZED MATERIALS"

Circle 55 on Reader-Service Card for more information

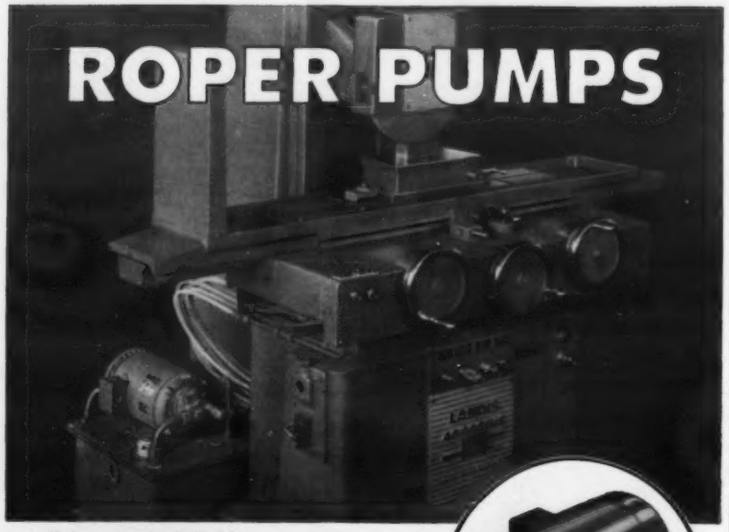


Photo courtesy Landis Tool Co.



supply hydraulic oil to surface grinder hydraulic system

• CAPACITY: .3–55 GPM • PRESSURE TO 400 PSI

The hydraulic system controlling the hydraulic table traverse and hydraulic crossfeed on this Landis 618 precision surface grinder is activated with a Roper Fig. 11TM748 pump and motor unit. The Series T hydraulic pump motor is the bell end of the ¾ hp, 1800 rpm electric motor. It delivers 2.8 gpm 150 SSU hydraulic oil at 200 psi. Landis Tool Co. has been using this Roper hydraulic pump motor on the 618 since introducing this hydraulic surface grinder in 1960. Many original equipment manufacturers requiring transfer, hydraulic or pressure feed work with clean liquids have found that Roper Series T pumps fit their specifications. There are 192 models of the Series T pump. Get full information about this efficient unit for your equipment.

PRECISION HANDLING OF HYDRAULIC WORK

- **PUMP GEARS** are steel, hobbed and shaved for balanced, quiet operation. Driven gear mounted on motor shaft eliminates couplings, reduces space.
- **BRONZE BEARING** in backplate assures proper alignment of driving and pumping elements.
- **MOTORS** for Series T units are open drip proof or totally enclosed types. Standard NEMA frame sizes are used throughout the series.

For information about your specific pump needs contact your nearest Roper dealer

Send for "How to Solve Pumping Problems" booklet

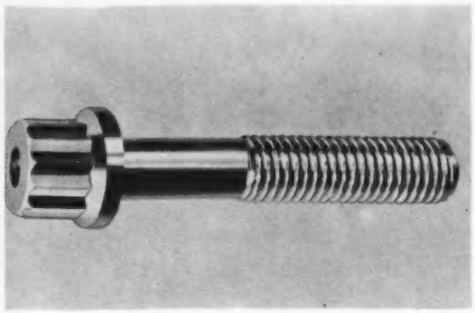
ROPER HYDRAULICS, INC.

Dependable pumps since 1857
COMMERCE, GEORGIA

Circle 56 on Reader-Service Card for more information

MECHANICAL

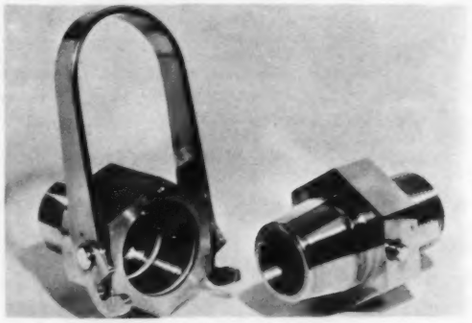
External Wrenching Bolts 320



To accommodate the nuclear and electronics industries, this line of fasteners now includes miniature-sized, 12-point, external wrenching bolts. Wrenching head will accept standard box and socket wrenches and offers advantages in high torquing for greater preloads where required. In addition to use of high-tensile and high-temperature resistant materials, these parts are manufactured in high-strength aluminums, brass, "Expandaloy" and nonmagnetic grades of stainless steel.

Mercury Air Parts Co., Inc., 9310 W. Jefferson Blvd., Culver City, Calif.

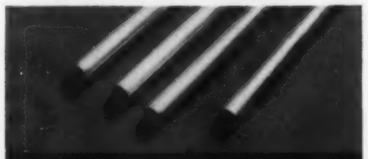
Liquid Oxygen Coupling 321



A quick-disconnect coupling for use with liquid oxygen and nitrogen systems fills the need for a coupling which is simple to connect or disconnect, yet is rugged enough for missile and ground handling. Couplings are keyed differently so that erroneous connection is eliminated. Male and female tapered units form a leakproof seal; heart of the device is a yoke-type lever which pivots on the female coupling and is fitted with slots that engage pins on the male assembly. Couplings with ID as small as 1/2 inch and as large as 8 inches are available.

Cryogenics, Inc., Stafford, Va.

Q. HOW THIN CAN METAL TUBING WALLS BE?



A. AS THIN AS 0.0005 INCHES!

It's a fact . . . fine seamless tubing with wall thicknesses as *ultra-thin* as 0.0005 inches! This is precision tubing drawn to any specified O.D. from 0.010″ to 0.375″ within tolerances of ±0.00005 inches.

Techniques for redrawing tubing so thin and within such close tolerances were developed in response to many requests for lightweight tubing with the properties of the many common metals and alloys. Accordingly, *ultra-thin* tubing is available in 304, 310, 316, 321 and 347 stainless steels, Monel, Inconel, Nichrome V, Tophet A, nickel, copper, beryllium copper and glass-sealing alloys.

Ultra-thin tubing is available cleanly cut to any specified length up to six inches. And speaking of light weight—500 feet of *ultra-thin* 304 SS tubing with an O.D. of 0.375″ and a wall thickness of 0.0005″ *weighs only one pound!* Rigid quality control assures you that every bit of *ultra-thin* tubing falls within the close tolerances.

If you need fine precision tubing with all the inherent properties of a particular metal or alloy listed above and must have the added advantage of light weight, investigate UNIFORM *ultra-thin* tubing by phoning or wiring the numbers below. Ask, too, about UNIFORM's proved abilities for fabricating tubular parts to exacting specifications. UNIFORM specializes in craftsmanship and fast delivery for fine tubing in most alloys and precious metals.

UNIFORM TUBES, INC. COLLEGEVILLE 2, PA.
HUxley 9-7276 TWX-CGVL 1044

Circle 57 on Reader-Service Card

Semiconductor Pressure Transducer 322

A subminiature pressure transducer measures only 1/4 inch in dia and is suitable for measurements in the 0-50 to 0-500 psi range. The device utilizes semiconductor strain sensing elements arranged in a full Wheatstone bridge to convert pressure-induced strains into high-level output signals. In many instances, use of amplifiers can be eliminated, giving improved reliability and reduced system cost and maintenance. Type PO3BA5 is applicable to a wide range of uses, such as telemetry, rocket engine testing, instruments and control systems, and model testing. Bridge



resistance is 500 ohms; excitation, 10v; open circuit output, 1v full range; nonlinearity and hysteresis, ±1 percent of full scale; continuous resolution; natural frequency, 40 kc at 100 psi range; and acceleration response, 0.002 percent of FS/g. Operating temperature range is −65 to 250F with a compensated range of 30 to 130F. Four-pin solder terminals allow simplified connection. Weight is less than 0.1 oz.

Micro Systems, Inc., 319 Agostino Rd., San Gabriel, Calif.

Circle 58 on Reader-Service Card

HOW TO HANDLE 3 Basic Timing Functions With ONE HAYDON CONTROL

Haydon Series DA Time Control Performs All Basic Timing Functions with Simple Timer and Relay Set-ups . . . Saves You Money, Simplifies Your Engineering.

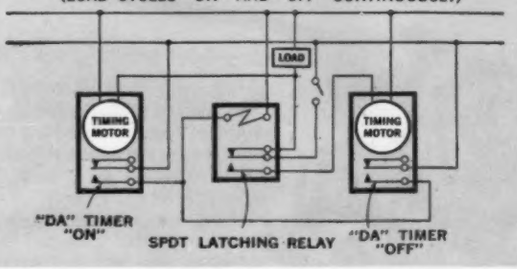
This reliable, *low cost* timing device easily adapts to hundreds of applications, avoiding the need for custom-built timers.

The Haydon Series DA Time Delay Timer is designed around a motor with a magnetically operated clutch. When the motor is energized, the clutch is engaged and the motor shaft drives an arm which . . . at the end of the desired interval . . . actuates a switch. When the motor is de-energized, the clutch disengages, permitting the arm to be reset by a spring.

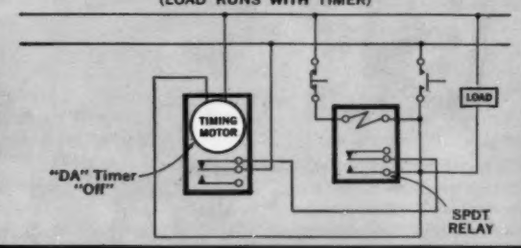


DA-11 — Hand set dial reading in seconds. Long terminal board; ranges up to 4.5 minutes.
DA-21 — Lock wrench set dial reading in percentages. Short terminal board; ranges up to 9.5 minutes.

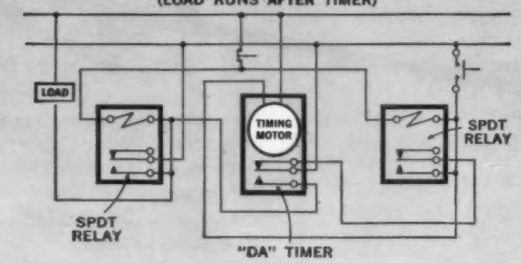
CYCLE TIMING: *(with 2 Timers, 1 Latching Relay)*
(LOAD CYCLES "ON" AND "OFF" CONTINUOUSLY)



INTERVAL TIMING: *(with 1 Timer, 1 Relay)*
(LOAD RUNS WITH TIMER)



TIME DELAY TIMING: *(with 1 Timer, 2 Relays)*
(LOAD RUNS AFTER TIMER)



SPECIFICATIONS

Switch Ratings — SPDT 20 amps, 125 or 250V ac resistive load. Maximum inrush: NC contacts 30 amps, NO contacts 15 amps. Switch capable of handling small fractional horsepower motors and components meeting these specifications. Other switches available.

Timing Motor Voltages — 120 or 240 volts, 50 or 60 cps.

Delay Ranges — Time delay of 0 to 14 seconds, 0 to 57 seconds, 0 to 4.5 minutes, 0 to 9.5 minutes.

For details on DA Series Time Controls, write to:

TIMING MOTORS
TIME AND TORQUE CONTROLS

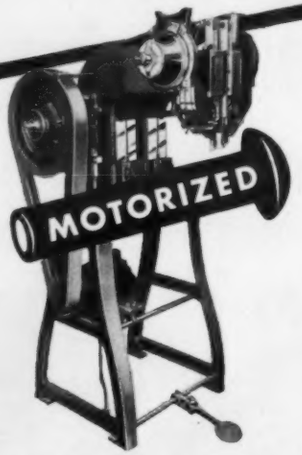
HAYDON

DIVISION OF GENERAL TIME CORPORATION

3233 EAST ELM STREET
TORRINGTON, CONNECTICUT

Why *Chicago Rivet* Offers TWO METHODS for Clinching Semi-Tubular Rivets

It is part of a widening service based upon industry's recognition that an assembly held together by semi-tubular rivets has great inherent strength and is usually lowest in production cost.



The Chicago Rivet MOTORIZED AUTOMATIC RIVET SETTER produces a sharp, solid blow that immediately upsets the tubular section. This method is used on 95% of all applications involving metals or non-fragile materials.



The Chicago Rivet AIRPOWERED RIVETER produces a cushioned, shock-free clinch on a tubular rivet, permitting riveting of fragile and uneven materials. This method has greatly widened the use of semi-tubular rivets.

FOR YOUR FILES



RIVET CATALOG describes 1388 standard tubular and split rivets and 25 single and multiple motorized automatic rivet setters.



AIR-POWERED RIVETING catalog contains description and specifications of 8 single and multiple riveters—also rivet setters designed for automated operation.

Why not let Chicago Rivet Fastening Engineers tell you which system is best for you. No obligation.

MOTORIZED
Line includes automatic single, multiple and automated setters.

AIR-POWERED
Line includes automatic single, multiple and automated setters.

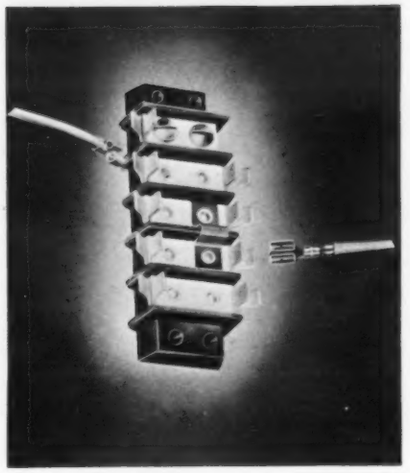
Chicago Rivet
& MACHINE CO.
961 So. 25th Ave., Bellwood, Ill.
(Chicago Suburb) Branch Factory:
Tyrone, Pa.

Circle 59 on Reader-Service Card for more information

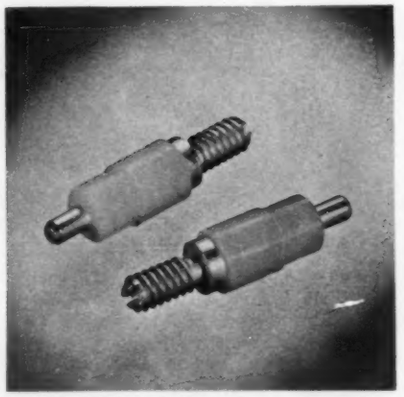
Self-Locking Terminations 323

Quick-disconnect, self-locking, wire terminations on the manufacturer's terminal blocks make possible up to six connections at each stage. The variangled tabs, designated "Kliptite", are designed to accept female wire terminations made by AMP, Burndy, Kent and Arkles, supplied either singly or in rolls for automatic machine assembly. Blocks are used widely in appliances, air-conditioning, vending machines and other types of equipment manufacturing or in any application that requires the positive but quick-disconnect feature.

Kulka Electric Corp., 633-43 S. Fulton Ave., Mt. Vernon, N.Y.



Screwdriver-Slot "Teflon" Terminal 324



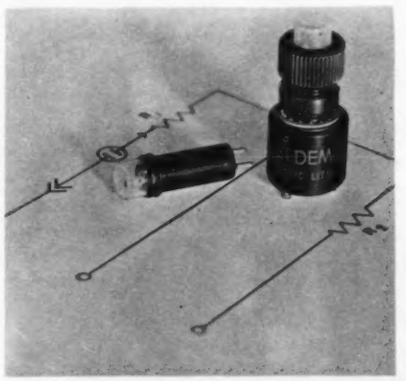
The "Press-Fit" Type FT-500 TI threaded feedthrough offers a screwdriver slot milled across the threaded stud to facilitate holding the mounted terminal while high torque may be applied to the terminal nut. Overall length is 0.743 inch. The threaded stud is No. 4-40-2A by 0.234 inch. A metal shoulder provides stop for tightening nut, while maintaining a high dielectric strength path from chassis. Mounting bushing dia is 0.171 inch. Stud is made of brass and may be silver or gold plated. Body is obtainable in any standard EIA color. Below-chassis stud is 0.070 inch in dia.

Sealectro Corp., 610 Fayette Ave., Mamaroneck, N.Y.

Waterproof Logic Light 325

A miniature logic light combines a waterproof panel-seal lamp holder with a built-in resistor network and a replaceable neon cartridge lamp with an O-ring seal. The unit requires only 0.625 inch behind panel and is used as a low-voltage, low-current indicator in transistor circuitry. Use of a seal at lamp and a seal behind panel combines to make the unit completely watertight. Potted resistor network is hermetically sealed, rigid to operate under conditions of 95-percent relative humidity. A variety of lens colors and shapes is available. Designed and manufactured in accordance with MIL-L-3661-A, the light is to be used where suitable driving circuitry is available.

Eldema Corp., 1805 Belcroft Ave., El Monte, Calif.



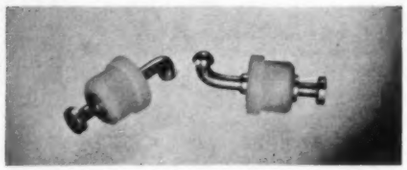
Miniature Latch-In Fault Indicator 326



This 3/4-inch magnetic latch-in indicator is available in wide current and voltage ranges to provide flexibility in meeting circuit requirements. A disc-type flag, which may be color-coded or imprinted to designate the function being monitored, rotates behind a sector window. When unenergized, the flag is magnetically held in the "off" position. When energized, it rotates to the "on" position and is held there magnetically while energizing source is removed. Return to normal "off" position is accomplished by reversing polarity of energizing source. The device maintains positive indication even when unenergized under vibration from 10 to 500 cycles at 10G.

Minneapolis-Honeywell, Precision Meter Div., Grenier Field, Manchester, N. H.

90-Deg Feedthrough Insulator 327

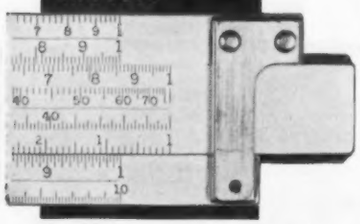


A reverse feedthrough insulator features "Press-Fit" design of "Teflon" body and provides a 90-deg turn in the conductivity path. Type RFT-SM-18 TUR-L2 lends itself to installations requiring through-chassis insulation and a terminal suited for alligator test clips placed in a vertical position from chassis. This component is also ideal where wiring configurations are such that the 90-deg turn permits a straight or axial run from the terminal. Overall height is 0.378 inch. Body dia is 0.148 inch. The metal stud, terminated in turrets on both ends, is made of brass, measures 0.040 inch in dia and may be finished in either solder or gold plate. Body is available in any standard EIA color.

Sealectro Corp., 610 Fayette Ave., Mamaroneck, N. Y.

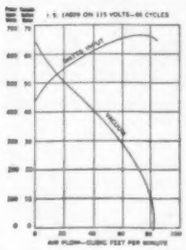
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Fractional Horsepower Motors



Lamb® Helps You Select The Right Vacuum Cleaner Motor

9/16 HP, 5-11/16" fan case diameter



IS-14750 thru ventilated

APPLICATION: Domestic portable cleaners.

IS-14809 by-pass ventilated

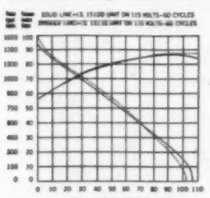
APPLICATION: Wet pick-up portable cleaners and central cleaning systems.

Service Life: Moderate
Cost: Low
Bulletins 101 & 201

NEW

1 HP, 7-3/16" fan case diameter

APPLICATION: Central vacuum systems in particular, also portable commercial wet and dry cleaners.



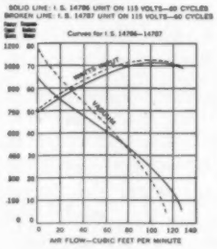
IS-15100 Diffused air discharge

IS-15110 Single air discharge

Service Life: Moderate
Cost: About twice cost of 9/16 HP
Bulletins 251 & 252

7/8 HP, 7-1/2" fan case diameter

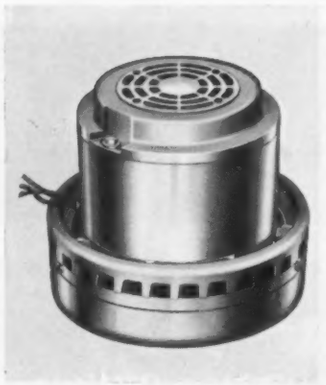
APPLICATION: Portable Heavy Duty Commercial Cleaners and Central Systems (three-stage).



IS-14786 2-Stage

IS-14787 3-Stage

Service Life: Long
Cost: About 3 times cost of 9/16 HP
Bulletin 301



IS-15100 (Diffuser Discharge)



IS-15110 (Single Air Discharge)

Special Requirements of Central Vacuum Systems Met by New High Performance Motor

Existing vacuum motors have been designed to perform best when incorporated into portable vacuum cleaners of standard types and sizes. Such motors are built to produce highest efficiency under air flow conditions that exist in normal domestic and industrial cleaning service and where hoses are of normal length and diameter.

On special applications, like central vacuum cleaning systems that utilize extremely long cleaning hoses, and where tubing losses are present, a special motor is required. To meet this need, Lamb now offers a vacuum motor which will maintain a relatively high vacuum with a modest amount of air flow. The result: these motors operate at high efficiency in the high vacuum range without sacrificing air flow performance under low vacuum conditions.

INPUT – 10 AMPERES at 115 VOLTS

For economical, cleaner design, this rating at Underwriters' test point was selected as the input limit. This allows use of line cord not exceeding number 16 type SJ and control switches of 10 ampere rating.

NEW TAPERED BLADE DESIGN

On central systems which employ centrifugal dirt separation, a small amount of fine dirt and lint must pass through the fan and is discharged outside of the building. For maximum efficiency, this type of fan blade is designed with a long backward curving sweep which, however, may accumulate fine dirt due to centrifugal action. This dirt builds up to a point where starting acceleration dislodges dirt from one blade, resulting in unbalance, noise, and vibration. Special steep angle blades have been used but they also have serious performance limitations.

Lamb research has developed a moderately steep blade angle plus a tapered form. The result is a compromise that yields excellent performance and all but eliminates the dirt loading problem.

CHOICE OF AIR DISCHARGE SYSTEMS

Lint accumulation is minimized and high vacuum is improved in the IS-15110 with a single tangential discharge pipe. This allows for easy connection to a discharge piping system, if desired.

The IS-15100, by discharging air through slots in the fan case, results in better noise suppression.

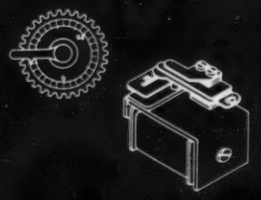
FAN-END BEARING IS PROTECTED BY AIR COOLING

Motors in central vacuum systems are often required to operate for long periods of time under sealed conditions – which results in a high temperature rise in the fan system. In ordinary by-pass type motors, the electrical parts have a separate cooling system, but bearings in the adjacent fan case often become hot enough to destroy the lubricant. Early failures can and do result. Lamb's new motor prevents this by providing a unique ventilating system which directs cooling air over the fan-end bearing and protects the motor from harmful heat built-up within the fan case. For complete details, write to Lamb Electric Company, Kent, Ohio – ask for bulletins shown at left. *Also available – explosion-proof model. Ask for bulletin 401.*

Now from TELEX/AEMCO



a complete new catalog of relay and timer products



TELEX/AEMCO
a division of Telex, Inc.
Mankato, Minnesota, U.S.A.

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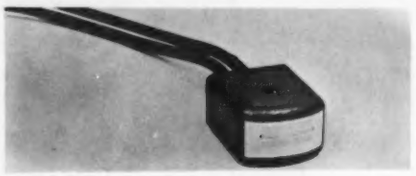
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City_____ State_____

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ELECTRICAL

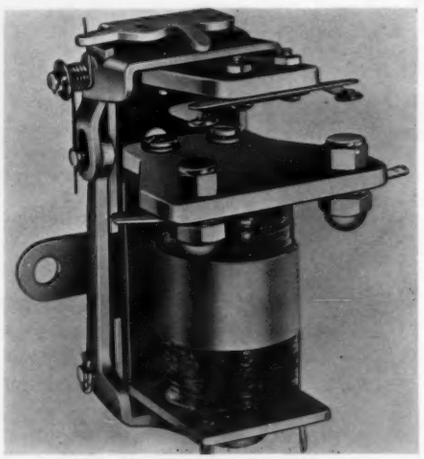
Record/Play Head 328



Built with the same techniques used in computer-type heads, this low-cost 1/4-track recording and playback magnetic head utilizes a 40-microinch gap for wide frequency response. The all-metal face increases tape life. Drawn case offers full shielding. The unit is obtainable in any inductance to 1 henry.

General Instruments Corp., Magne-Head Div., 65 Gouverneur St., Newark, N. J.

HV Relay 329



Designed for making and breaking high-voltage circuits of low current-carrying capacities, this small continuous-duty relay offers d-c coil voltages to 250v. Contacts will break up to 5000v rms at 200-ma current. Contact arrangements are: 1A (SPST normally open, double-make); 1B (SPST normally closed, double-break); and 1C (SPDT, double-break). Dielectric strength is 6000v rms from terminals to ground, 500v rms from coil to ground. Dimensions of the 7.5-oz unit are 1-29/32 by 3-1/16 by 2-7/32 inches.

Elgin National Watch Co., Elgin Advance Relays, Electronics Div., 2435 N. Naomi St., Burbank, Calif.

An important announcement to users and buyers of miniature and instrument ball bearings

Caveat emptor

"There is hardly anything in the world that some men cannot make a little worse and sell a little cheaper and the people who consider price only are this man's lawful prey."

attributed to John Ruskin

The past three months have seen much activity in the miniature and instrument bearing field. Starting with MPB's introduction of MINA Bearings (ABEC 3 precision grade), the bearing user has been confronted more recently with fluctuating prices as well as the introduction of low-priced Class 5 bearings. These events have produced numerous questions from bearing users, chiefly concerned with how the price reductions affect performance and reliability, and puzzlement over the real need for a class 5 bearing with uncertain performance levels.

Prices for miniature and instrument bearings are based on the grade of precision (*ABEC tolerance specifications) and at the same time related to the quality controls needed to insure performance and reliability. Thus, to effectively specify bearings, the designer and buyer must understand exactly what price means both in terms of performance and grade of precision. There are five ABEC grades of precision for miniature bearings, as shown in the following table of tolerances:

**ABEC stands for Annular Bearing Engineers' Committee of the Anti-Friction Bearing Manufacturers Association (AFBMA).*

ABEC TOLERANCES (in ten thousandths of an inch) — MINIATURE BEARINGS

ABEC grade	INNER RING					OUTER RING					ring width tolerance +0
	bore +0	raceway runout with bore	face runout with bore	groove runout with face	width variation	o.d. +0	raceway runout with o.d.	face runout with o.d.	groove runout with face	width variation	
ABEC 1	−3	3	—	—	—	−4	6	—	—	—	−50
ABEC 3	−2	2	—	—	—	−3	4	—	—	—	−50
ABEC 5	−2	2	3	3	2	−2	2	3	3	2	−50
ABEC 7	−1½	1	1	1	1	−2	2	1½	2	1	−50
ABEC 9	−1	½	½	½	½	−1	½	½	½	½	−10

Two important facts are quite evident from this chart:

(1) There is only a small quantitative difference in the tolerances for the complete range of grades, and even a much smaller quantitative difference between, for example, ABEC 5 and ABEC 7.

(2) Many factors extremely pertinent to bearing performance in precision instrument applications are not covered by ABEC specifications. The ABEC specs provide excellent definitions of *dimensional* accuracy, but this is *all* they define.

Some of the important factors affecting bearing performance not covered by ABEC standards are:

1. Material and heat treatment of bearing components.
2. Smoothness of operation.
3. Cleanliness, or freedom from contamination.
4. Noise and vibration level in operation.
5. Starting torque.
6. Running torque.
7. Conformity of race to ball (race curvature).
8. Surface finish of bearing components.
9. Load capacity.

In many applications one or more of these factors may be far more important to bearing performance than the dimensional accuracy (precision grade) of the bearing. The bearing user must recognize exactly what is, and what is not covered by ABEC specs; and he must coordinate this information with the operating requirements of his specific application. *(An MPB bearing engineer will be glad to assist you).*

MPB has established numerous standards for its bearings, in addition to the dimensional tolerances of the ABEC grades, which include special material and heat treatment specifications, special noise and vibration tests, surface finish tolerances and inspections, race curvature control, and extensive precautions to ensure cleanliness of the finished product.

From the viewpoint of value analysis, these controls which assure quality and performance can affect cost of the bearing as much or even more than operations required to achieve a certain grade of precision. *Therefore, the sophisticated bearing buyer knows that any drastic cost reduction for a given precision grade bearing reflects omission or slackening of controls.*

This approach to marketing is not consistent with MPB's philosophy of producing a high quality product at a fair price. Therefore, we have established a production and pricing policy which results in fair-value unit costs without any sacrifice in inspection controls. MPB's new policy is as follows:

MPB will produce standard bearings in two precision grades — "Basic 7" and ABEC 3. "Basic 7" is MPB's designation for ABEC 7 bearings with .0002" (ABEC 5) tolerance on bore dimension to facilitate fitting practice. Standard ABEC 7 bore tolerance can be furnished at no extra cost. ABEC 3 bearings produced by MPB are designated by the tradename MINA Bearings. ABEC 5 grade bearings will be produced only on special order.

Features such as special radial play, special lubrication, packaging, coding, etc., formerly supplied at no additional cost (these costs were amortized over all bearing production), will now carry a price additive. Consequently, changes have been made in the price of basic bearings. Through this pricing plan every user is assured of highest bearing quality and reliability, but each customer pays for only those special requirements that he specifies. To most customers this plan will result in substantially better bearing prices.

You are cordially invited to send for MPB's new Engineering Catalog and new prices. The latter, too, are virtually miracles in miniaturization.

Horace D. Gilbert, *President*

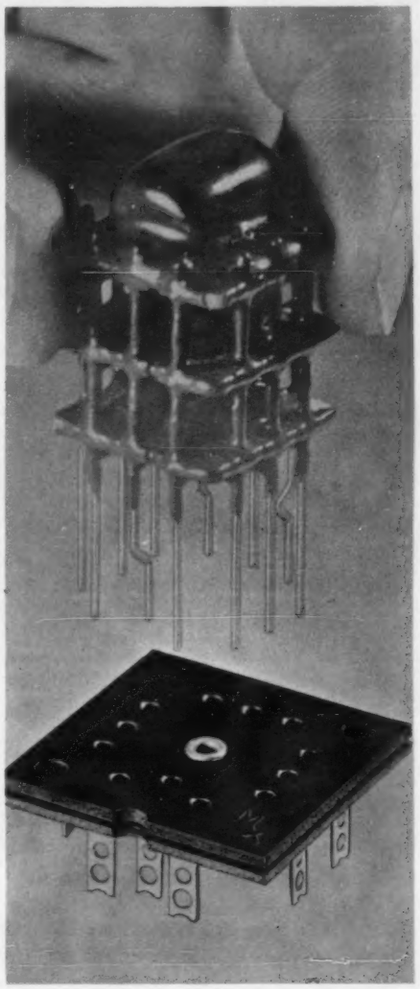
MPB *Helps you perform miracles in miniaturization*

MINIATURE PRECISION BEARINGS, INC., PRECISION PARK, KEENE, N. H.

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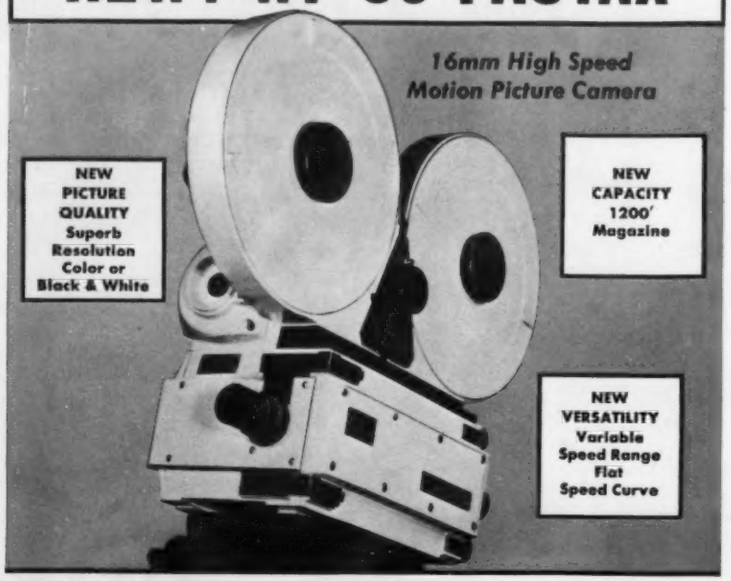
Module Socket 330

A socket designed to accept module resistor and capacitor stacks affords production-line and service advantages. Production gains through standard solder connection point provided for assembly convenience. Module can be disconnected quickly for testing—time-consuming unsoldering and resoldering is avoided. Insulating wafers are NEMA grade XP chocolate. Brass contacts are barrel-type, cadmium-plated and designed to remain in place when module is engaged to socket.



Mandex Mfg. Co., Inc., Dept. DN-1, 2614 W. 48th St., Chicago, Ill.

NEW! WF-30 FASTAX



Years Ahead in Design and Performance

A high speed camera with large film capacity . . . with a variety of speed ranges and high resolution has long been wanted by industry, the military and the government. The FASTAX WF-30 fills all these requirements and more. Darkroom loaded, "T" core, the magazine holds sufficient film for most studies. Camera versatility is another key feature. Variable speed range, controlled by a solid state loop servo device . . . rapid acceleration with flat speed curve within ±4% selected rate . . . start-stop capabilities. Superb resolution over entire frame results from excellent lens system and a sector shutter between rotating prism and focal plane.

WRITE for complete information and prices on WF-30 . . . the newest FASTAX in the wide line of Wollensak high speed motion picture cameras.



WF-32
OSCILLOGRAPHIC
RECORDER

WOLLENSAK
OPTICAL COMPANY • ROCHESTER 21, N. Y.

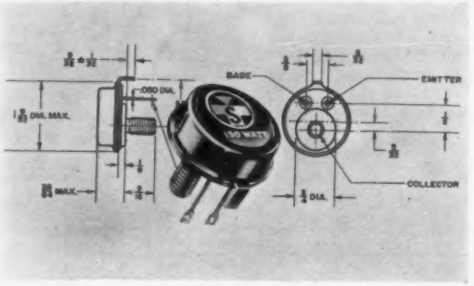
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Usable Design Ideas

ELECTRICAL

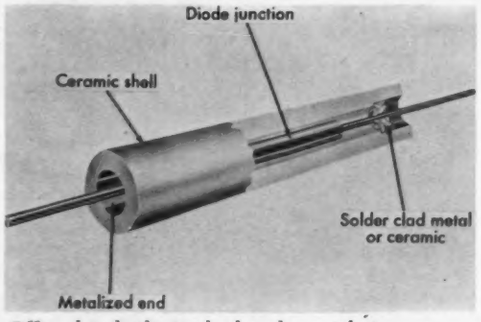
High-Power Transistors 331



Two new high-power transistors, Types 2N1015 and 2N1016, are diffused-junction, NPN high-power devices suitable for applications in power converters, power-supply regulators, relay controls and replacements or in d-c and servo amplifiers. Both types are 150w, single-end stud units with collector-emitter voltages of 100v; saturation resistance of 0.5 ohm, and minimum Beta of 10 at 5 amps. Other specifications include low leakage currents, low thermal resistance, high temperature stability and reliability at full power ratings.

Silicon Transistor Corp., Carle Place, N. Y.

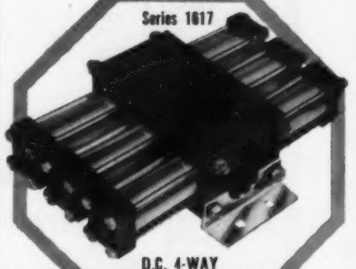
Ceramic Diode Closure 366



Offered in both standard and special sizes, a new ceramic diode closure meets hermetic requirements of military specifications and is suitable for thermal cycling between −65 and 150C. The closure consists of a metallized ceramic shell with a band of metal fired onto inner edge at each end. Two end caps are supplied with each shell and feature a clad metal part. Advantages of the ceramic unit include high impact resistance, good dielectric properties and resistance to oxidation. Lengths are 3/8, 1/2 and 1 inch; diameters to 1 inch are obtainable.

Metalizing Industries, Inc., 338 Hudson St., Hackensack, N. J.

WATERMAN



D.C. 4-WAY
SOLENOID VALVES

High pressure
Low leakage
No dynamic seals

Complete range of types—closed-center, tandem, two-position configurations, etc.

3000 p.s.i. pressure—rated pressure may be applied to all ports.

Operate solenoids without flow or pressure.

Light and compact—weighs only 5 pounds complete.

All moving parts operating in oil.

The photograph shows three Waterman Series 1617 D.C. 4-Way Solenoid Valves banked for convenient installation. Standard kits, including mounting feet, are available for banking up to seven valves; more on special order. Installation of multiple valves is greatly simplified. It is easy to add more functions later.

Send today for
new Catalog 2003

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WATERMAN
HYDRAULICS CORPORATION

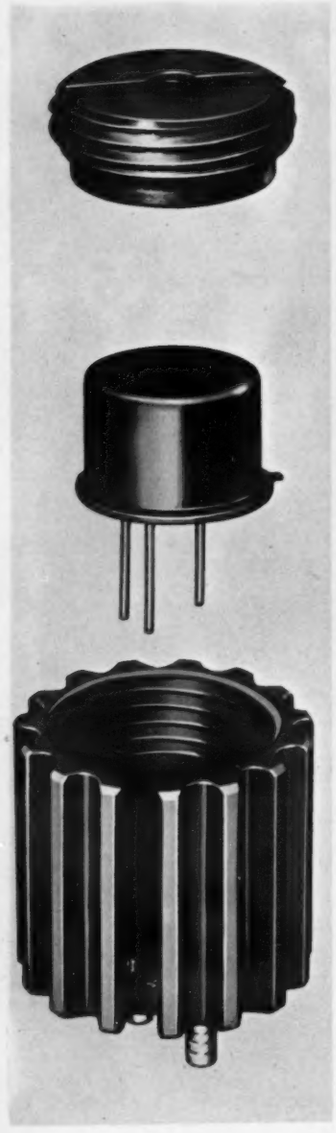
725 Custer Ave., Evanston, Ill.

Circle 64 on Reader-Service Card

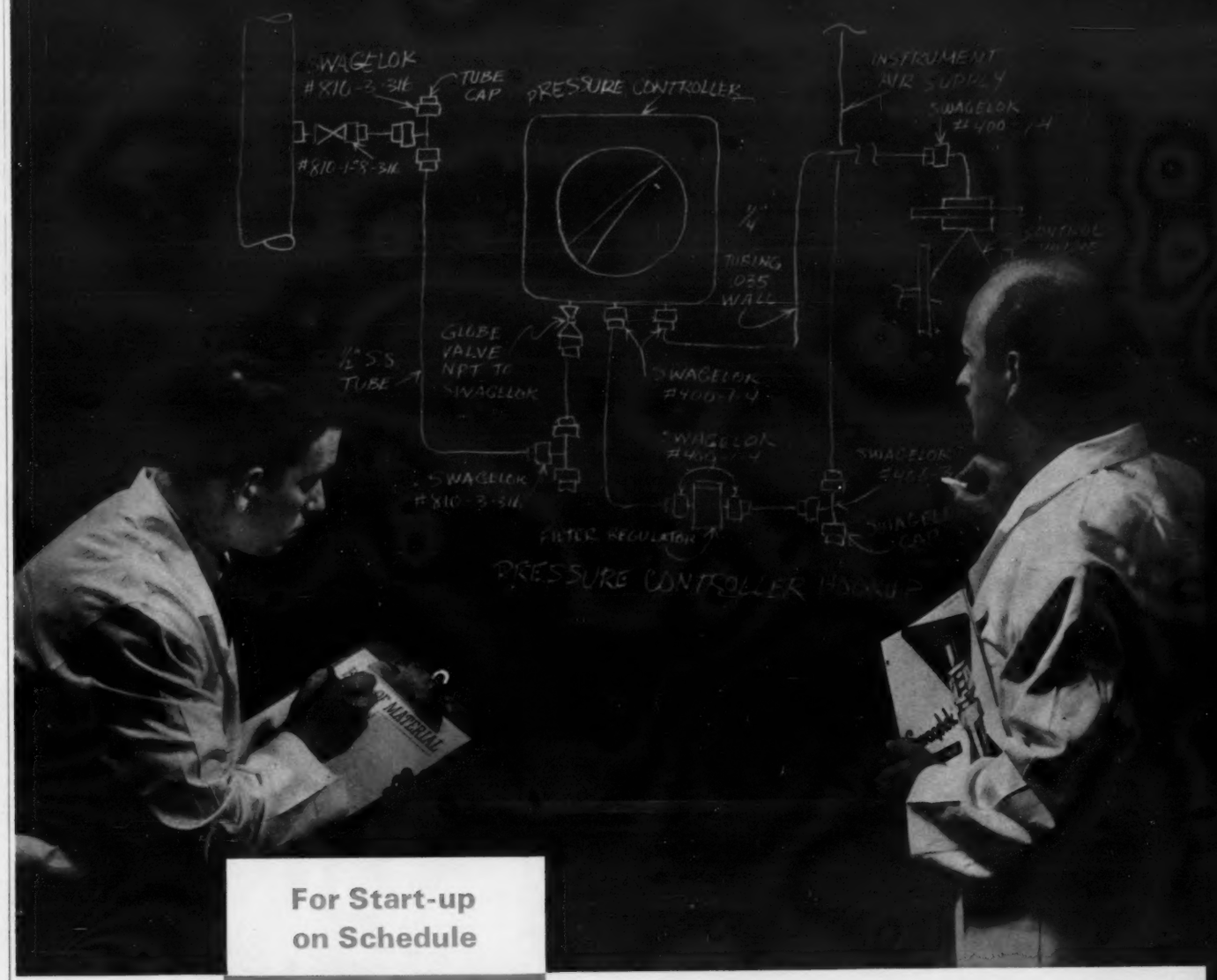
Heat Dissipator **367**

A miniature transistor socket and integral heat dissipator form a compact unit only 9/16 inch in dia by 9/16 inch high. The device is designed with maximum thermal contact between sink and transistor for optimum heat conduction and dissipation. Use of a 4-40 fastener allows the unit to be mounted in larger sinks. Aluminum surfaces of dissipator are especially treated to provide electrical insulation without impairing heat transfer.

Omega Precision, Inc., 757 N. Coney Ave., Azusa, Calif.



Circle 65 on Reader-Service Card



For Start-up on Schedule



Don't Let Leaky Connections Cause Expensive Delay at Start-up

These engineers are specifying Swagelok for plant construction. The most severe test of tube fitting design and quality is in plant construction. Many plants have been built using 10,000 to 20,000 or more Swagelok tube connections without a leak. You can spend days to find one leak among the thousands of tube connections on a construction job.

Insure plant start-up on schedule—specify Swagelok

CRAWFORD FITTING COMPANY, 884 East 140th St., Cleveland 10, Ohio
CRAWFORD FITTINGS (Canada) LTD., Niagara Falls, Ontario, Canada

IN A MANHOLE OR ON A MIXER

Wagner® "Stand-up" motors pack plenty of power

Here's plenty of power for equipment requiring normal thrust vertically mounted motors. Wagner® Vertical Solid Shaft Motors provide power without problems for your pumps, mixers, agitators, axial fans, centrifuges, presses . . . anywhere you need a vertical motor drive with plenty of stamina.

Wagner Vertical Solid Shaft Motors are end-mounted, squirrel-cage type with a NEMA Type "P" base that is precision-machined to mate with equipment. Smooth running under cyclic loads, they won't labor or stall . . . conform with NEMA Design B motor requirements in all respects. Their cast iron construction is simple and rugged . . . stands off corrosion . . . stands up to rough, tough treatment. Here are motors that are designed to give you economical, maintenance-free service the year 'round, indoors or out.

Wagner "Stand-up" Motors are available in ratings of 1 hp and larger with nominal full load speeds of 3500, 1750, 1160, or 870 rpm, and can be supplied with a completely dripproof enclosure, a standard totally enclosed fan-cooled enclosure, or an explosion-proof TEFC enclosure. Whatever the horsepower, whatever the enclosure, whatever the application, one thing is sure . . . these compact, power packages get the job done. For all the reasons why, check with the Wagner Sales Engineer in the Wagner branch nearest you, or write us for Bulletin MU-249.

Branches and Distributors in all Principal Cities

Wagner Electric Corporation

6487 PLYMOUTH AVENUE, ST. LOUIS 33, MO., U.S.A.



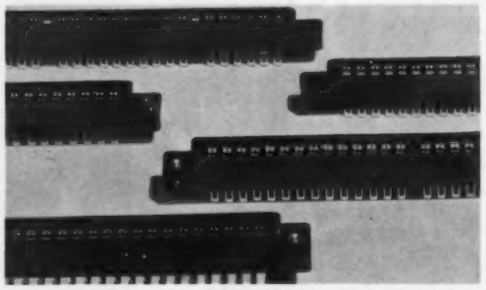
WM61-8

Wagner Vertical Solid Shaft Motors provide the power for Smith & Loveless sewage pumping stations.



Circle 66 on Reader-Service Card for more information

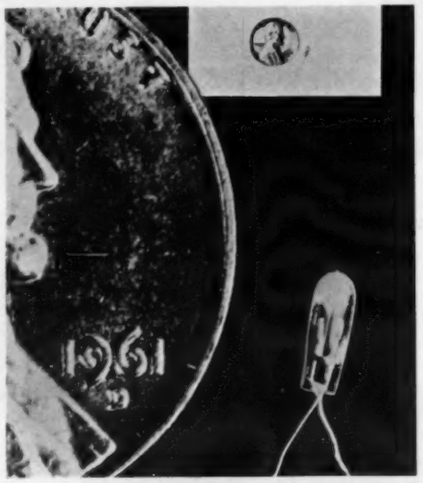
Printed-Circuit Connectors 332



Bifurcated, bellows-type, printed-circuit connectors provide complete and continuous contact when subjected to extremes of vibration and shock. Single and double-row connectors in various multiples up to 130 contacts are available from on-shelf stock or special designs can be fabricated on "four-slide" presses.

Masterite Industries, 839 W. Olive St., Inglewood, Calif.

Microminiature Lamp 333



Drawing only 5 ma and operating on a voltage of 1.2 or 1.5v, subminiature lamps of this size offer unusual and useful design application. Starting with a lamp envelope dia of 0.0139 inch with a length of 0.138 inch, the tiny units give a light output of 40 to 45 millilumens and have a lifetime of 1000 hr minimum. In instrumentation, lamps can be used as needle lights, mounted on the tip of instrument pointers. In electronics, they can serve as indicator lamps, in computer readout devices or in photoelectric systems.

Miniature Lamp Engineering Co., 350 Broadway, New York 13, N. Y.

BARDEN PRECISION BALL BEARINGS

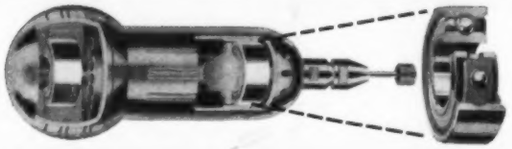
If your product needs bearings with close mounting tolerances, high geometrical accuracy, low torque or low vibration . . . if it operates at high speeds or high temperatures . . . specify *Barden Precision.*

For less difficult applications, the consistent quality, predictable performance and reliability of *Barden Precision* ball bearings can cut your assembly time, rejection rates and teardown costs.





For gear trains: Barden standard low torque bearings with closely controlled radial play and low eccentricity assure minimum backlash. Precision flanges provide accurate positioning surfaces and permit through-boring, eliminating the need for housing shoulders and reducing manufacturing and assembly costs. Sizes from .1562″ to .8750″ O.D.

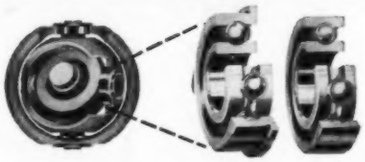


For power tools, aircraft and missile accessories, and other high speed applications: Barden "T" retainer bearings with high load capacity and long, trouble-free life. Double shielded, grease lubricated "T" retainer bearings have operated more than 6,000 hours at 80,000 RPM. Sizes from .5000″ to 3.3465″ O.D.



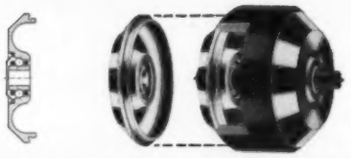


For synchros: Volume produced precision bearings with extra-large outer rings designed to serve as end caps, thereby reducing synchro complexity and cost and increasing air gap accuracy. Barden-developed synchro bearings have closely controlled radial play and minimum eccentricity to meet tight air gap specifications. Sizes from .3750″ to 2.0000″ O.D.



For gyro gimbals and other torque-sensitive devices: Barden "W" retainer reduces torque peaks and eliminates retainer lock. "W" retainer bearings save one gyro manufacturer $100 per unit by reducing costly teardown. Sizes from .1562″ to .6250″ O.D. Also other standard and special design gimbal bearings, including the Barden Dynamic Bearing with near-zero torque.

For gyro rotors: Barden special design end-bell bearings to increase accuracy and reduce assembly cost of miniature gyros. Bearings become part of spin mass and serve as end caps for wheel assembly, reducing mating part errors and improving squareness, concentricity and overall accuracy. Sizes from .615″ to 1.016″ O.D. Also other standard and special types including inertial gyro bearings with 20-microinch tolerances.



For memory drums, high precision spindles and other low runout applications: Barden duplex pairs with extremely low eccentricity and non-repetitive runout. Matched pairs with accurately controlled preload provide high load capacity, smoothness and long life along with radial and axial rigidity. Sizes from .3125″ to 3.3465″ O.D., deep groove or angular contact.





Major manufacturers of instruments, mechanical components, computers, spindles and aircraft accessories regularly specify *Barden Precision* ball bearings for high performance mechanisms.

To specify *Barden Precision* ball bearings—prototype, pilot run or large volume production—ask for a Barden sales engineer to give you on-the-spot assistance, or write for Catalog C-3.

for reliability... specify

BARDEN PRECISION BALL BEARINGS

THE BARDEN CORPORATION, 230 Park Ave., Danbury, Conn. · Pioneer 3-9201
Western Office: 3850 Wilshire Blvd., Los Angeles 5, Calif. · DUnkirk 5-0034

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Now—Finishes Add Beauty to Tough Malleable Castings

Beautiful, protective finishes on tough Malleable iron castings will give your products a superior combination of appearance, ruggedness, and economy. Get complete information on this sales-getting combination from any of the progressive companies that display this symbol —

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New Ideas for your products are suggested in Data Unit No. 115, available free from any member of the Malleable Castings Council, or write to Malleable Castings Council, Union Commerce Building, Cleveland 14, Ohio.



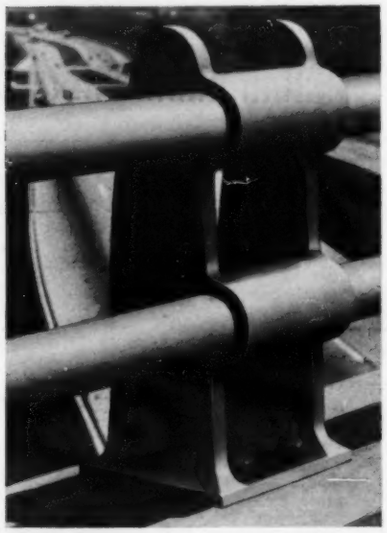
The castings shown have been painted, blued, chromium and cadmium plated, plastic coated, porcelain enameled, galvanized, and machined

When appearance and long service life are important to your products, Malleable castings offer many advantages. Painting, hot dip galvanizing, blueing, and electroplating have long been used with Malleable castings because of their economy, attractiveness, and resistance to a variety of destructive conditions.

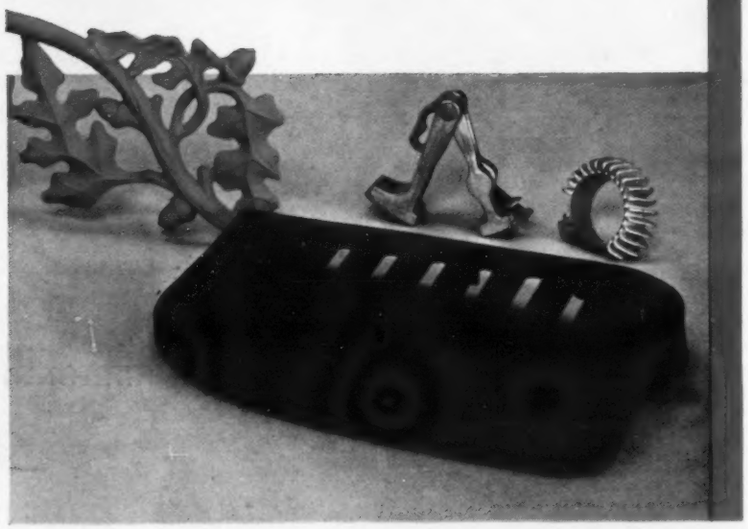
Several exciting new finishes appear very promising and are currently being tested by Malleable producers. Vinyl plastic in thin, contour-hugging films or thick, resilient coatings provide exceptional chemical resistance, and are available in a wide spectrum of strikingly beautiful colors.

Another attractive finish is porcelain enamel. In addition to smooth, gleaming surfaces in unlimited colors, it has excellent resistance to heat and chemicals.

The variety of finishes which can be successfully applied to Malleable gives designers outstanding opportunities to combine decorative and protective surfaces with the rugged dependability, economy, and versatility of Malleable castings. Call your Malleable supplier for information and quotations.



Bridge railing posts on the Connecticut Thruway are Malleable castings for three important reasons: (1) strong, ductile Malleable offers far greater resistance to fracture upon collision than other materials tried, (2) Malleable is easily galvanized for additional salt air corrosion resistance, and (3) with thousands of these posts in use, Malleable's economy produced real savings.



For Quality and Economy Use

MALLEABLE

For Service Contact...

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Connecticut Mall. Castings Co., New Haven 6
Alloy Foundries Division, The Eastern Co., Naugatuck

ILLINOIS
Central Fdry. Div., Gen. Motors, Danville
Chicago Malleable Castings Co., Chicago 43
Moline Iron Works, Moline
Moline Malleable Iron Co., St. Charles
National Castings Co., Cicero 50
Peoria Malleable Castings Co., Peoria 1
Wagner Castings Company, Decatur

INDIANA
Albion Malleable Iron Company, Muncie Division, Muncie
Link-Belt Company, Indianapolis 6
National Castings Co., Indianapolis 22

IOWA
Iowa Malleable Iron Co., Fairfield

MASSACHUSETTS
Belcher Malleable Iron Co., Easton

MICHIGAN
Albion Malleable Iron Co., Albion
Auto Specialties Mfg. Co., Saint Joseph
Cadillac Malleable Iron Co., Cadillac
Central Fdry. Div., Gen. Motors, Saginaw

MINNESOTA
Northern Malleable Iron Co., St. Paul 6

MISSISSIPPI
Mississippi Malleable Iron Co., Meridian

NEW HAMPSHIRE
Laconia Malleable Iron Co., Laconia

NEW YORK
Acme Steel & Mall. Iron Works, Buffalo 7
Frazer & Jones Company Division The Eastern Co., Solvay
Oriskany Malleable Iron Co., Inc., Oriskany
Westmoreland Mall. Iron Co., Westmoreland

OHIO
American Malleable Castings Co., Marion
Central Fdry. Div., Gen. Motors, Defiance
Dayton Mall. Iron Co., Ironton Div., Ironton
Dayton Mall. Iron Co., Ohio Mall. Div., Columbus 16
National Castings Co., Cleveland 6

PENNSYLVANIA
Buck Iron Company, Inc., Philadelphia 22
Erie Malleable Iron Co., Erie
Lancaster Malleable Castings Co., Lancaster
Lehigh Foundries Company, Easton
Meadville Malleable Iron Co., Meadville
Pennsylvania Malleable Iron Corp., Lancaster

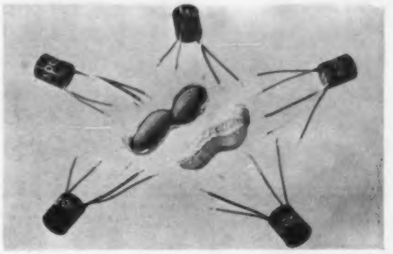
TEXAS
Texas Foundries, Inc., Lufkin

WEST VIRGINIA
West Virginia Mall. Iron Co., Point Pleasant

WISCONSIN
Belle City Malleable Iron Co., Racine
Chain Belt Company, Milwaukee 1
Federal Malleable Company, Inc., West Allis 14
Kirsh Foundry Inc., Beaver Dam
Lakeside Malleable Castings Co., Racine
Milwaukee Malleable & Grey Iron Works, Milwaukee 46

These companies are members of the Malleable Castings Council

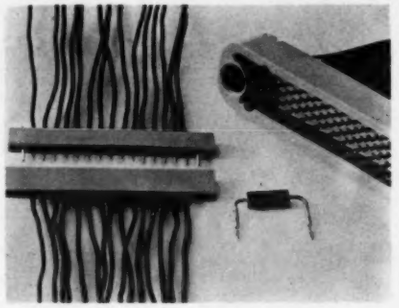
Microminiature Transformers 334



A wide range of applications is suited for this microminiature transformer. The line meets industrial and military specification MIL-T-27A. Included are models with balanced four-winding designs for differential input parallel circuit isolation or other instrumentation applications. Transformers are manufactured under rigid military quality-control requirements for performance, reliability and low cost. Types may be made to customer specification.

James Electronics, Inc., 4050 N. Rockwell St., Chicago 18, Ill.

Microminiature Connectors 335



Low-cost, highly reliable connectors—220 and 221 Series—are offered in rack and panel and in strip in-line, stacked or special configurations. Both are small in size, permitting contact density of 100 to 175 contacts per sq in. Maximum current rating in each case is 3 amps, with a temperature range of −65 to 250F. Beryllium-copper contacts are spring-tempered to resist deformation. These can be realigned with ease after severe bending. Their design provides multiple points of contact, avoiding irregular current-voltage characteristics.

Amphenol Connector Div., Amphenol-Borg Electronics Corp., Broadview, Ill.

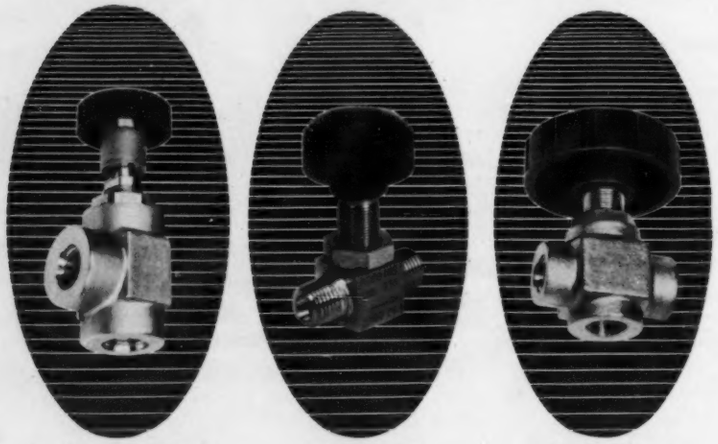
DO YOU HAVE PROBLEMS IN THE SMALL PIPING FIELD?

WE'D LIKE TO HELP YOU ...BUT WE NEED YOUR HELP

We're specialists in the small piping valve field...producing very high quality, precision-built valves for everyday as well as unusual applications. If you have a special problem that's giving you trouble, we'd like to hear from you...possibly we can help, either by suggesting one of our standard specialized valve items, or a slight modification. Please write, giving us complete details. DO IT TODAY!

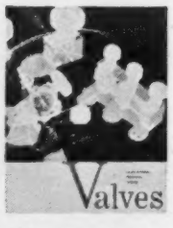
ROBBINS VALVES ARE PRECISION MADE FOR PERFORMANCE!

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HIGH PRESSURE | INSTRUMENT | THREE-PORT

Here are three typically unique items in the Robbins Valve line. The high pressure valve operates up to 12,000 PSI, is pressure balanced, easily operated, panel mounts in one minute, serviced from front of panel. The instrument valve is really miniature... weighs only 0.31 lb., body is only ¾" square, operates from hi-vacuum to 3500 PSI, provides absolute shut-off, low torque, fine metering control, leakproof operation. The three-port valve simplifies stocking problems...can be used as globe or angle valve (with sealing plug), or with relief valve, pressure gauge or another line connection in third port.



Write TODAY for 16-page illustrated brochure in color! AND...if you have a special problem in valving of small piping...include all details. We'd like to help.

ROBBINS Aviation Inc.

3817 S. Santa Fe Ave.
Los Angeles 58, California
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Magnetic Sensing Device

336



Measuring only 0.500 inch in length, 0.130 inch in width and 0.019 inch in thickness, this tiny sensor is furnished with 7-1/2-inch leads of 34-gage copper. The active area is 0.080 by 0.180 inch. A companion unit, with an active area of 0.058 by 0.148 inch, measures 0.195 inch in dia and 3/16 inch in total length; it carries 34-gage copper leads 14 inches long. Both units are of noninductive construction, making possible new and improved a-c applications. Models BH200 and BH203 exhibit low-noise output, improved low-level performance and high Hall output combined with low zero field output voltage to eliminate need for external null voltage compensation in many applications. Both axial and transverse devices operate in the broad temperature range of −40 to 100C and are designed for continuous operation at 85C.

F. W. Bell, Inc., Semiconductor Div., 1356 Norton Ave., Columbus 12, Ohio.

NOW 15 to 450 GPM!

VIKING'S ENLARGED LINE OF HEAVY DUTY HELICAL GEAR DRIVEN PUMPS



Figs. 288 and 388 units with size "C" reducers, capable of handling up to 25 H.P. at 350 pump R.P.M.; 40 H.P. at 520 pump R.P.M. 20 to 450 G.P.M. capacities. Five gear ratios available, using one gear case. Six pump sizes in this series.

You now have an even larger range of Viking's helical gear driven units to fit your pumping jobs. Speed and capacity now range from 15 to 450 G.P.M. They're ideal for handling both thin and thick liquids, ranging from gasoline to molasses. Pumps equipped with packing or mechanical seals. Gear reducers independently mounted. All components can be quickly changed. Step up your delivery with these quiet, positive discharge, self-priming pumps!



Fig. 288 units with size "B" reducers, capable of handling up to 10 H.P. at 1750 R.P.M. motor speed. 15 to 225 G.P.M. capacities. Six sets of gearing using one gear case. Six pump sizes in this series.

50 YEARS

Send today for catalog SP-534J

VIKING PUMP COMPANY

Cedar Falls, Iowa, U.S.A. In Canada, It's "Roto-King" Pumps
See Our Catalog in Sweet's Product Design File

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with DE-STA-CO



TOGGLE CLAMPS

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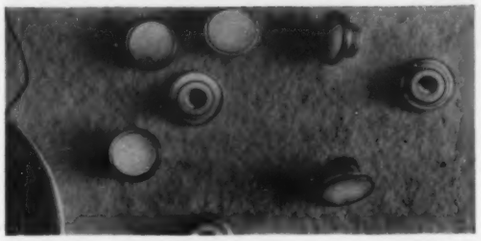
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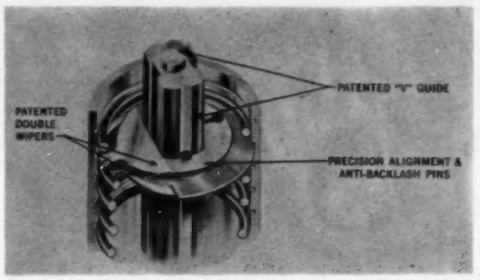
Tunnel Diodes 337



Tunnel diodes manufactured from GaSb (a compound semiconductor) demonstrate the low-noise and high-frequency properties attainable from gallium antimonide over a temperature range of —55 to 100C. Units are designed for use in low noise UHF and microwave amplifiers. Cutoff frequencies are in the 2 to 4 kmc range as well as noise constants 40 percent less than those obtainable from germanium units. At present, available peak currents are 1 and 3 ma with a 10-percent variation allowed. Peak-to-valley ratios of GaSb diodes are superior to germanium units. Typical peak-to-valley ratios of commercial types are 16:1 and 20:1. All are in pillbox package which has a low series inductance of 0.3 micromicrohenry.

Micro State Electronics Corp., 152 Floral Ave., Murray Hill, N. J.

Subminiature Potentiometer 338



Rugged mechanical construction and precision electrical characteristics are new features of the Series 341 potentiometer. The rotary-type pot is useful for application in avionics and other precise analog computing systems where size, function and reliability are prime requisites for operational efficiency. The rotary component is also available with a clutch for servo installation. In series, a "V" guide is combined with precision alignment and antibacklash pins to provide a double wiper system which effectively doubles resolution and eliminates intermittents caused by shock and vibration. The unit is offered in resistance ranges from 1 to 600K, can carry 2.5w in still air at 40C and operates from −55 to 140C. Overall size is 1/2 inch in dia by 1 inch long.

Daystrom, Inc., Potentiometer Div., Archbald, Pa.

HANSEN

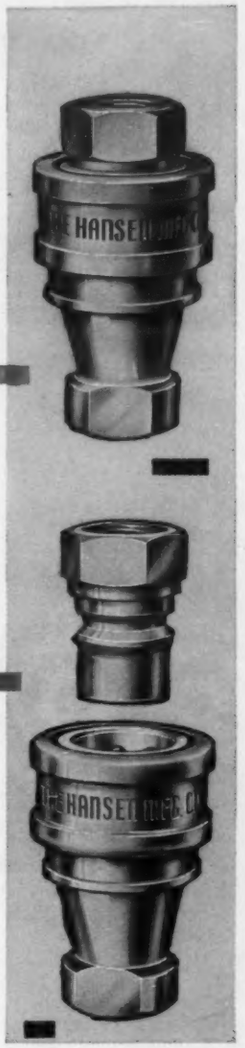
TWO-WAY SHUT-OFF COUPLINGS

QUICK CONNECTION OR DISCONNECTION OF FLUID LINE CIRCUITS

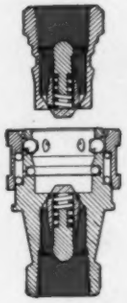
WITH

INSTANT AUTOMATIC FLOW OR SHUT-OFF

Instantly shuts off both sides of circuit...prevents loss of liquid, gas or pressure



When Coupling is disconnected, identical valves in both the Socket and Plug provide instant shut-off of gas or liquid. To eliminate leakage or spillage during disconnection, the Coupling is so designed that shut-off takes place *before* the Plug separates from the Socket—and *before* the seal of the Socket itself, provided by the Socket "O" Ring, is broken.



In reverse, when Coupling is connected, the "O" Ring in the Socket completely seals Coupling *before* valves release flow of fluid from both sides of circuit—thus eliminaitng possibility of spurt of gas or liquid during instant of connection.

Available in brass or steel with female pipe thread connections from 1/8" to 1½" inclusive—also up to 1" in stainless steel.

Quick-Connective Fluid Line Couplings for

COMPRESSED AIR • HYDRAULIC FLUIDS
WATER • VACUUM • STEAM • GASOLINE
ACETYLENE • REFRIGERANTS • OXYGEN
OIL • GREASE • COOLANTS • LP-GAS



Write for the Hansen Catalog

Here is an always ready reference when you want information on couplings in a hurry. Lists complete range of sizes and types of Hansen One-Way Shut-Off, Two-Way Shut-Off, and Straight-Through Couplings.

Representatives in Principal Cities... see Yellow Pages

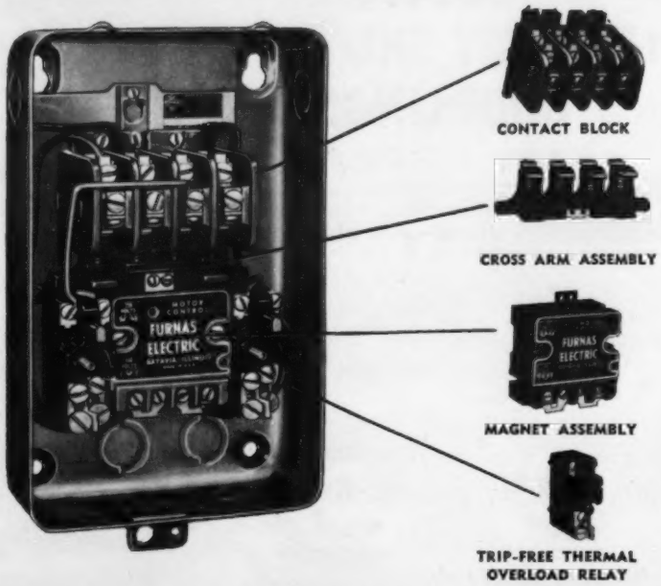
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THE HANSEN MANUFACTURING COMPANY

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CROSS ARM ASSEMBLY—of high-impact material for millions of operations. Stainless steel contact springs. Visible and front removable silver-cadmium oxide contacts.

MAGNET ASSEMBLY—dual voltage—dual frequency coils, 110-220 or 220-440 volts. Magnet features just one moving part. Layer wound encapsulated coil with built-in terminal board. Coils are built to withstand moisture, fungus and combustion.

TRULY TRIP-FREE THERMAL OVERLOAD RELAY—
—manual or automatic reset. Non-adjustable trip assures tamper-proof operation. Third overload kit can be added in the field.

A106

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1078 McKee Street, Batavia, Illinois

FURNAS ELECTRIC COMPANY

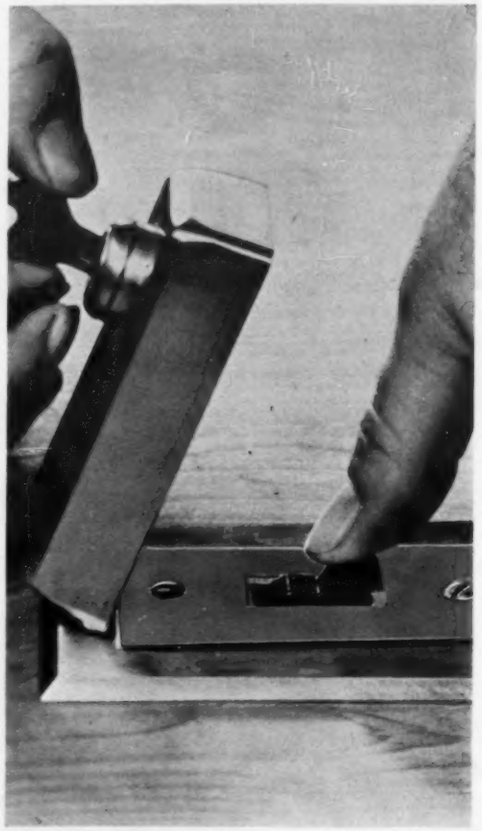
BATAVIA • ILLINOIS

Sales Representatives in All Principal Cities

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ELECTRICAL

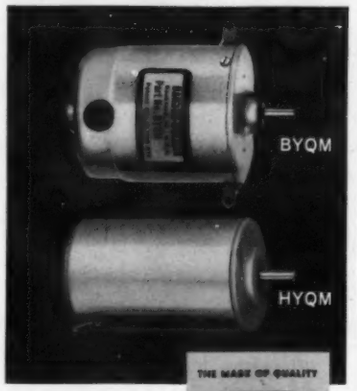
Electric Switch Safety Device 339



A cover attachment with a Yale tumbler lock assures positive control of electrical switches. The new safety device fits over any metal wall plate, whether single or ganged. It also eliminates the possibility of unauthorized persons tampering with the switch. The unit can be adapted to virtually any situation where switch control is necessary or important. The lock comes with two duplicate keys and, for the customer's protection, additional keys are never supplied. This attachment can be quickly and easily installed over an existing flush toggle switch—except the interchangeable type—without any change in wiring. Manufactured in brushed brass or in any of the standard finishes, the unit is said to be the first Yale Tumbler Lock Switch in a-c only 120-277v types as well as a-c/d-c type. With the straight keying system, all locks are either keyed alike and operate on the same key, or they are keyed differently and individually to operate on different keys. The latter type cannot be master keyed.

Harvey Hubbell Co., Bridgeport, Conn.

Barber-Colman battery-operated d-c motors with integral governors



ideal for many of today's portable applications

THE MARK OF QUALITY
BARBER COLMAN

Type BYQM, top, is inexpensive, yet of excellent quality to meet consumer demand for dependability in mass-produced goods. Type HYQM is an exceptionally fine-quality battery-operated motor for the more demanding applications such as portable dictating equipment.

BYQM-Typical Specifications

Voltage range	approx. 3 to 30
Governed speed	1200 to 6000 rpm
Torque	0 to .20 oz-in.
Diameter	1.29"

HYQM-Typical Specifications

Voltage range	4.5 to 30 volts
Governed speed	1500 to 5000 rpm
Torque	0 to .20 oz-in.
Diameter	1"

TYPICAL APPLICATIONS

PORTABLE DICTATING MACHINES
PHOTOGRAPHIC EQUIPMENT
DRIVE MECHANISMS
TAPE PLAYERS
ROTATING BEACONS
DEPTH FINDERS
BLOWERS
PORTABLE INSTRUMENTS
ROTISSERIES

WRITE FOR HELPFUL DATA SHEETS on BYQM and HYQM battery-operated motors specifically designed to fit individual customer applications.

BARBER-COLMAN COMPANY
DEPT. U, 1810 ROCK STREET, ROCKFORD, ILLINOIS

Circle 74 on Reader-Service Card

Silicon Cartridge Rectifiers 340

Latest in a growing line of semiconductor devices are two new series HV silicon cartridge rectifiers, S-5490 through S-5507 and S-5518 through S-5535. Both series include 18 different types. The ferrule mounted series range in sizes from 1-1/16 to 6-1/16 inches, have maximum rectified d-c output currents varying from 45 to 100 ma and peak inverse voltage ranging from 1500 to 16,000v. Axial lead series range in size from 1/2 to 2-1/2 inches. Peak inverse voltage starts at 1000v, ranging to 10,000v, with maximum rms input voltage ranging from 420 to 7000v. Maximum average rectifying currents at 25C vary from 75 to 250 ma, and at 100C from 25 to 100 ma.

Sarkes Tarzian, Inc., 415 N. College Ave., Bloomington, Ind.

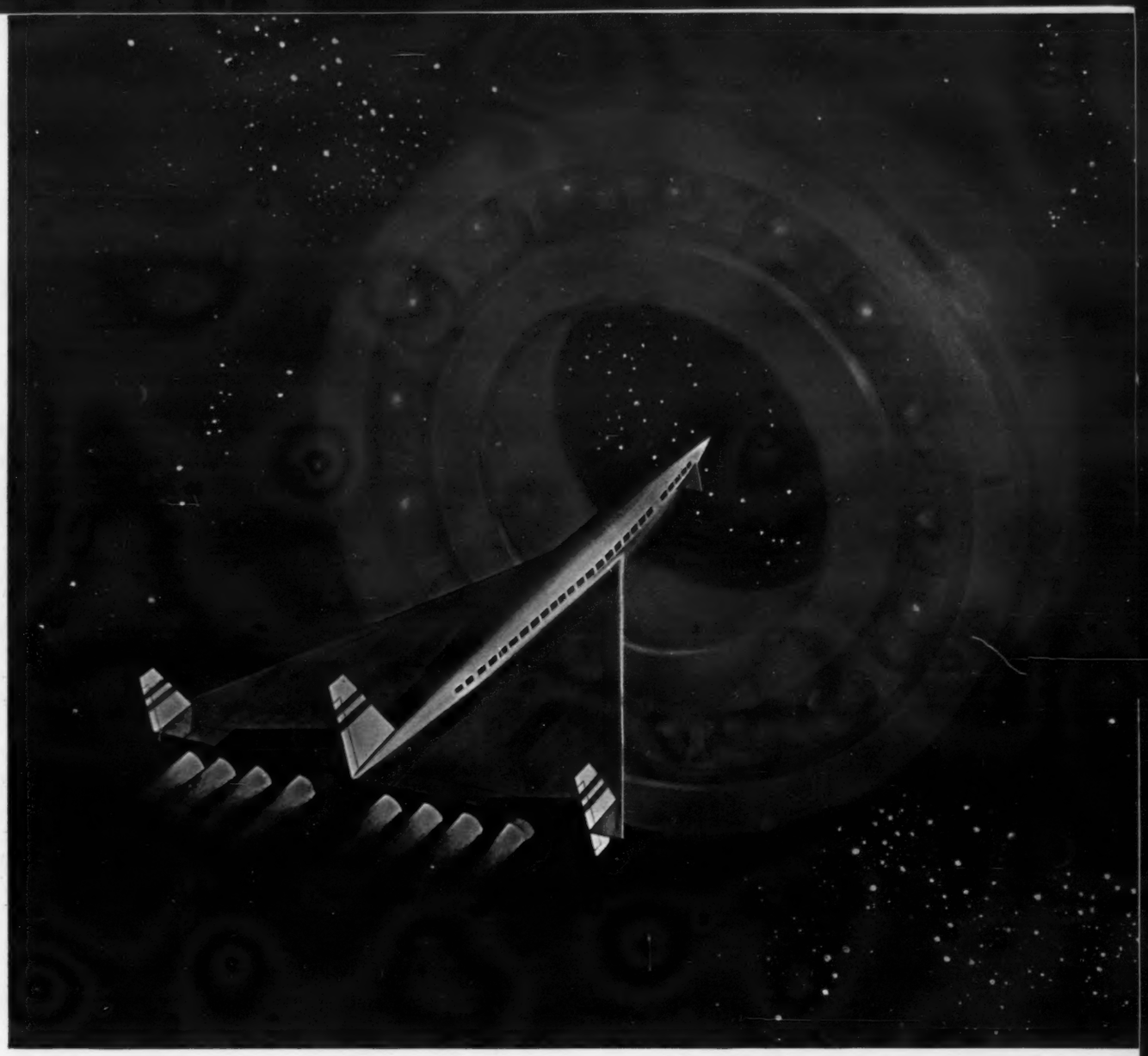
Semiconductor Mount 341



Direct-chassis mounting of JEDEC TO-3 outline power transistors, diodes and rectifiers is an advantage apparent in a new molded socket to offer heat transfer by conduction into chassis. Insulating plastics are obtainable in three variations: general-purpose black phenolic per MIL-M-14, Type CFG; melamine per MIL-M-14, Type MME; diallyl phthalate per MIL-M-18794A (Navy), Type SDG. Contacts are designed to accept either 0.040 or 0.050-inch-dia pins. Molded-in threaded bushings are brass per MIL-B-895 (Ships); nickel-plated per QQ-N-290.

Augat, Inc., 33 Perry Ave., Attleboro, Mass.

Circle 75 on Reader-Service Card



BEARING
WITH A
RED HOT FUTURE

SKF MOTION ENGINEERING

Advanced ball and roller bearing technology

On special test equipment in SKF's research laboratory, experimental ball and roller bearings are run at temperatures up to 1000° F and above—conditions under which steel becomes red hot and loses its strength, while conventional lubricants burn or boil away. To meet these problems, bearings made of special heat-resisting alloys and exotic new materials are tested and evaluated. New ideas in design and new approaches to lubrication are constantly being investigated.

Bearings to resist extremely high temperatures are needed for improved, high performance jet engines, gas turbines and other equipment. Special SKF bearings have been tested successfully in environments at about 1000° F. Under certain conditions of operation, much higher temperatures are practical.

Research like this is your assurance that SKF will always keep pace with demands for the highest possible performance in all major types of rolling contact bearings —ball, cylindrical roller, spherical roller, tapered roller and precision miniature. SKF Industries Inc., Philadelphia 32, Pa.

6103

Pressure-Sensitive Nameplates 342

Decorative trim and nameplates are available heat-stamped, embossed, silk-screened and die-cut in almost every conceivable arrangement. New materials are also obtainable, including metallic and clear "Mylars", vinyls, aluminum foils and wood or leather grains. The line opens new opportunities to add new style to products while helping reduce costs.

Allied Decals, Inc., Dept. 761-A, 20700 Miles Ave., Cleveland 28, Ohio.

Vinyl Surfacing 343



A decorative wear for use on metal, wood, fiber-glass-reinforced polyester and other subsurfaces is flexible, easily bonded, durable and resistant to fading and most stains. "Decorlon" has high dimensional stability, a heavy vinyl face, is mold and mildew resistant and has a flame-spread rating of 20 when tested in accordance with ASTM E-84-59T. The material is offered in three embossed textures, 20 colors and two gages. On special orders, the vinyl may be perforated in a variety of patterns when desirable for headlining in automotive, boat or airplane uses. "Decorlon" comes in 0.030 and 0.040-inch gages on a backing of "Hydrocord", a moisture-resistant felt of inorganic fibers. Lengths up to 105 lineal ft, 54 inches wide, are available, split to desired widths. It is easily bonded with a variety of adhesives.

Armstrong Cork Co., Lancaster, Pa.

HOWARD



MODEL 29-500 UNIVERSAL and DC MOTOR 1/12 to 1/4 H.P.

AMERICA'S FINEST SMALL UNIVERSAL MOTOR... AT THE LOWEST COST IN ITS CLASS!

for applications where uniform output is essential . . . all mating surfaces are machined!

- Choice of permanently lubricated shield or sealed ball bearings, or rigid sleeve type with felt oil reservoir and oil return system.
- Choice of end bells to provide for end mounting, flange mounting or attaching gear units.
- Available with a choice of totally enclosed case, or ventilated construction with internal fans.
- Currently in use in computors, blowers, dental equipment, business machines and other applications.

WRITE FOR COMPLETE DETAILS AND NEW CATALOG

DIAMETER: 3⅛"

LENGTH: 4¹⁵⁄₁₆" to 5¹⁵⁄₃₂"

H.P.: Continuous: Series—1/6 @ 10,000 R.P.M.
Shunt or Compound—1/12
Intermittent Series—1/4 @ 10,000 R.P.M.
Shunt or Compound—1/6

SPEED: No load: Series—15,000 R.P.M.
Shunt or Compound—12,000 R.P.M.
Full Load Speed: Series—3000 to 10,000 R.P.M.
Shunt or Compound—1000 to 10,000 R.P.M.

VOLTAGES: Series—6 to 250 V. AC/DC
Shunt or Compound—6 to 230 V. DC

THE NATION'S MOST COMPLETE LINE OF FRACTIONAL H.P. MOTORS

UNIVERSAL & DC 1/200 to 1 H.P. | INDUCTION 1/1400 to 1/4 P. | SHADED POLE 1/2000 to 1/30 H.P. | GEAR MOTORS | MOTOR PARTS SETS | BLOWERS

HOWARD



for business machines and gear applications . . . this motor offers *longer brush life*, no stalls!

WON'T STALL EVEN WHEN JARRED
Self-aligning sleeve-type bearings have finger-type pressure plate for uniformity of alignment.

EXTRA-HEAVY STAMPED STEEL HOUSING
Helps maintain smooth performance under all conditions . . . makes this motor ideal for gear applications.

INCREASED BRUSH LIFE
Brush holders are broached to hold close tolerances for brush alignment.

DIAMETER—2 1/2" LENGTH—3 15/16"

	SERIES MOTOR	SHUNT MOTOR
FULL LOAD SPEED	5000 to 10,000 R.P.M.	2000 to 7000 R.P.M.
MAXIMUM H.P. Continuous	1/12 @ 10,000 R.P.M.	1/20 @ 5000 R.P.M.
MAXIMUM H.P. Intermittent	1/8 @ 10,000 R.P.M.	1/12 @ 5000 R.P.M.
VOLTAGES	12 to 230 V. AC/DC	6 to 120 V. DC

Maximum H.P. ratings shown. Variations available for less power to meet application requirements.

WRITE FOR DETAILS AND NEW CATALOG

POWERED BY HOWARD

HOWARD INDUSTRIES, INC 1705 State St., Racine, Wis., Telephone ME 2-2731, Teletype: RAC344

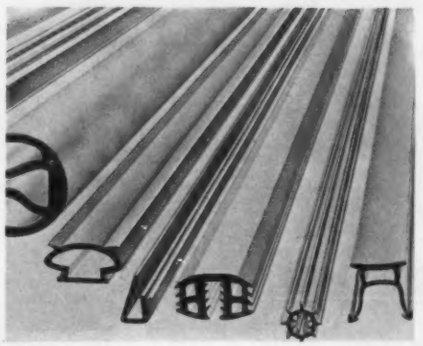
Sales Offices:
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Festus, Mo., 1049 Front St., YE 7-3606 **New York area:** 157 Broad St., Redbank, N. J., SH 1-3356

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EMC ELECTRIC MOTOR CORPORATION · CYCLOHM MOTOR CORPORATION · LS LOYD SCUGGS COMPANY · RACINE ELECTRIC PRODUCTS

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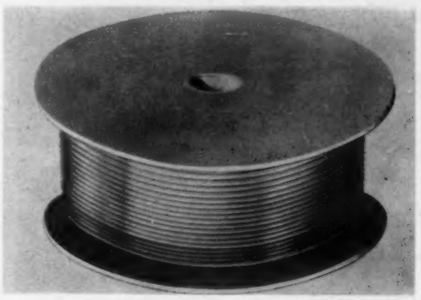
Vinyl Extrusions 344



Vinyl offers an optium balance of physical, chemical and performance properties, providing required structural strength while also offering thermal insulation, moisture resistance, resistance to electrolytic and chemical corrosion, and resilience to shock. There are unlimited possibilities and economical advantages offered in extrusions fabricated from vinyl.

American Vinyl Corp., 1675 E. 11th Ave. Hialeah, Fla.

Copper Capillary Tubing 345



Vacuum-annealed copper tubing is completely clean and free of residue inside with a bright finish outside. It is furnished on level-wound disposable reels. High uniformity and controlled grain-size capillary is produced with a new vacuum-annealing furnace. Following the drawing process, the bore is rinsed with a special solvent to remove all residue, oxide, scale and drawing lubricant. The annealing process then removes final traces of solvent by vaporization. Specifications of the tubing include: alloys, copper ASTM B68, B75; OD, 0.031 to 0.500 inch; walls, 0.004 to 0.040 inch, and lengths in coils up to 1000 ft, straight lengths 1/4 inch to 15 ft. Tolerances are held to as narrow as 0.0005 inch.

Avins Industrial Products Corp., 50 Broadway, New York 4, N. Y.

Phenolic Glass Laminate 346

Grade PG-381 is designed for applications requiring high insulation and resistance to temperatures as high as 800F. Available in thicknesses from 0.125 to 0.750 and greater, the laminate is produced in accordance with the requirements of MIL-R-9299 (Type II Class 2) and is offered in various sheet sizes ranging from 9 by 10 to 20 by 36 inches.

Mica Corp., 4031 Elenda St., Culver City, Calif.

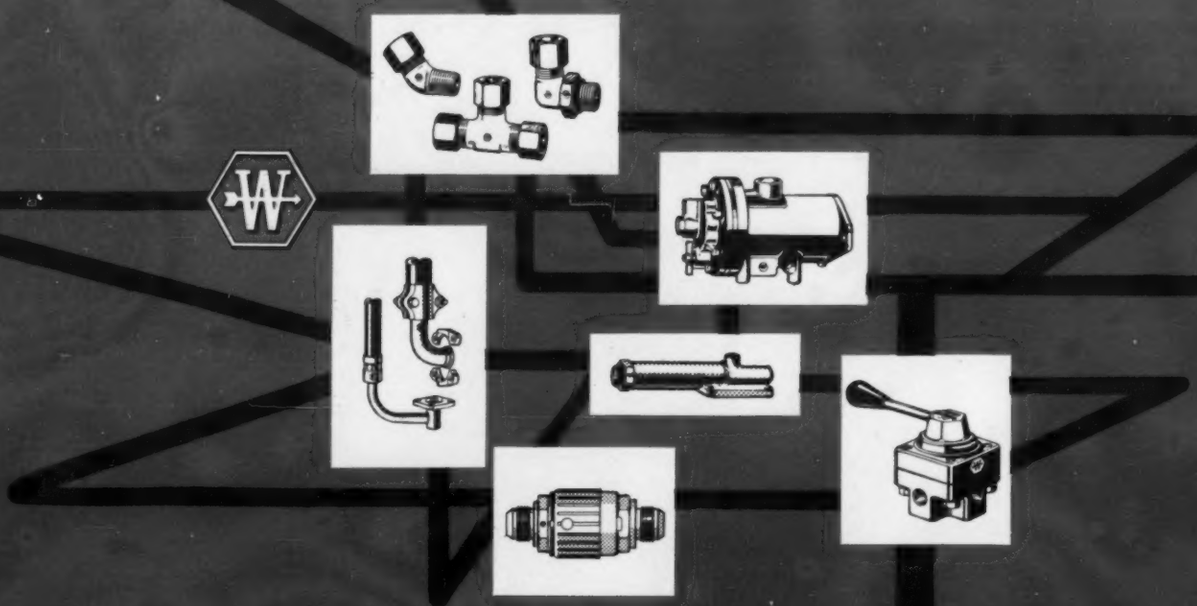
Epoxy Pipe 347



A rigid plastic composed of a thermosetting resin reinforced with a nonwicking, inert filler is fabricated by a new process, producing glass-smooth bore and uniform wall thickness. Pipe E-21 is available in 10-ft lengths in dia sizes from 1-1/2 to 12 inches. Chemical resistance of pipe can be varied to meet a range of corrosion problems by proper selection of the resin and filler.

Resisto Chemical, Inc., Wilmington 99, Del.

WEATHERHEAD FLUID POWER PRODUCTS... SYSTEM ENGINEERED



WEATHERHEAD ERMETO

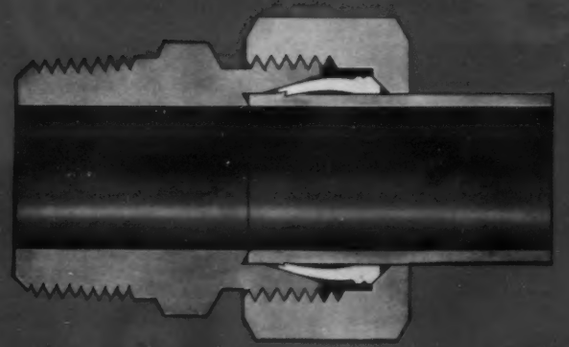
"THE ONLY FITTING WE'VE FOUND THAT ELIMINATES TROUBLE"

This is typical of reports from users of these self-sealing, high-pressure flareless connectors. Reasons: ease of assembly and disassembly; no special tooling required; avoids threading and flaring while providing positive seal; reusable—maintaining no-leak, stress-free support of tubing after multiple make and breaks.

Weatherhead Ermeto fittings are engineered to withstand severe vibration, shock, pulsating loads, temperature extremes, and pressures to 15,000 psi.

For your fluid system reliability, specify Weatherhead Ermeto.

A complete range from ⅛" to 2" is available from your nearby Weatherhead distributor.



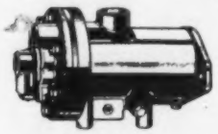
ERMETO®
"Hermetically sealed"

THE WEATHERHEAD COMPANY
CLEVELAND 8, OHIO

WEATHERHEAD
HYDRAULIC POWER
Components

VARIABLE DISPLACEMENT PUMPS

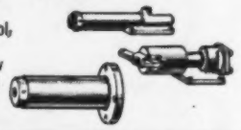




Meet J.I.C., S.A.E., and M.S. standards. Pressures to 3000 psi

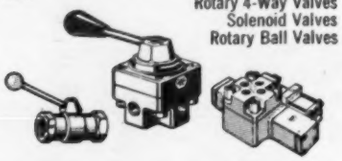
PUMP CONTROLS

Pressure Control, Automatic (Constant) Flow Control, Manual Displacement Control



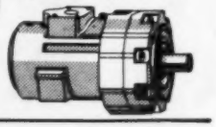
DIRECTIONAL CONTROLS

Rotary 4-Way Valves
Solenoid Valves
Rotary Ball Valves



HYDRAULIC DRIVES

Fixed Displacement Hydraulic Motors, Reversible Variable Displacement Hydraulic Motors (Integrated Torque and Speed Control)



HIGH PRESSURE HOSE AND FITTINGS

Swaged, Crimped, and Field-Attachable Flexible Hose Ends. Flared and Flareless Tube (Pipe) Fittings. Integral Check Valves



SELF-SEALING COUPLINGS

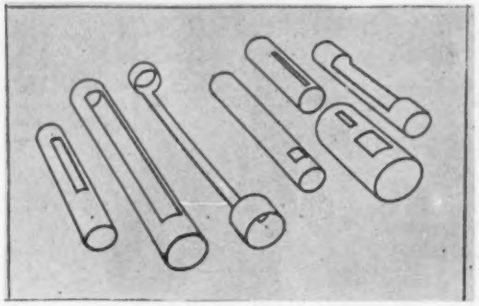
Ball Check Valve Type
Full-Flow Rotary Ball Type



THE WEATHERHEAD CO.
300 EAST 131 ST. • CLEVELAND 8, OHIO
Distributors in all major markets

Circle 77 on Reader-Service Card

Aluminum Tubing Cutouts **348**



An economical method for making cutouts in thin-wall aluminum tubing, as well as in other materials, increases production by 1000 percent over standard milling and slitting procedures now used. Deburring is almost eliminated. The process is applicable on tubing 1-1/2 inches in dia and up. Cutouts can be made as small as needed on diameter and to whatever portion of tubing that is desired to be left. Cuts can start anywhere from 1/4 to 12 inches maximum on one end of the tubing; the other end can be any length. Samples may be obtained on request.

T. G. Persson Mfg. Co., 2 Henry St., Bloomfield, N.J.

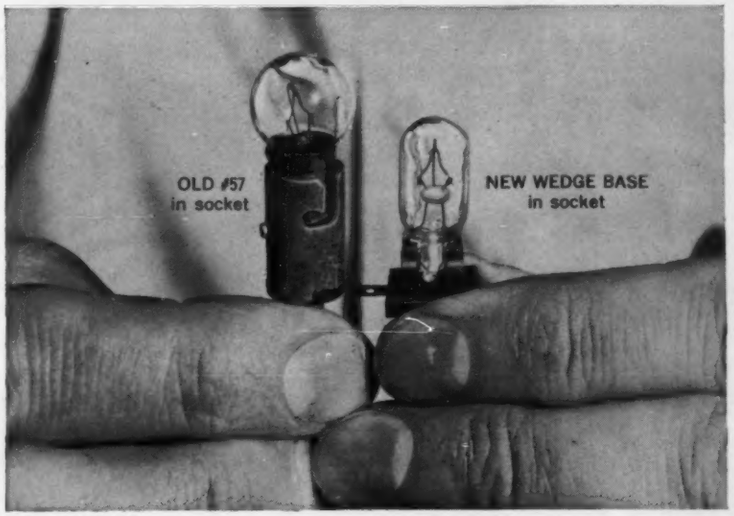
Wire Markers **349**



Designers can now write their own codes or legends on the spot with new self-laminating "Write-On" wire markers. These identifications are used where small quantities of markers with many different special legends are needed. Each self-adhering marker is a write-on and is partly transparent as a self-contained lamination extension. When applying a marker around wire, the remaining protective clear portion wraps around itself, causing it to laminate permanently over written code. Markers are suitable in prototype operations, R & D, maintenance or production work. The "E-Z Code" system offers a permanent adhesive bond around wires because each marker is applied by the tab—not by the adhesive. Free working samples from a variety of stock sizes are available.

Western Lithograph Co., Westline E-Z-Code Div., 689 E. 2nd St., Los Angeles 54, Calif.

NEW G-E "WEDGE BASE" LAMP SAVES SPACE, SAVES MONEY, SAVES TIME, SAVES MANPOWER



The new "Wedge Base", all-glass, incandescent indicator lamp is an exclusive G-E development designed to replace the old #57 and other similar bayonet-based lamps. It's available in 6.3 and 12 volts. See below.

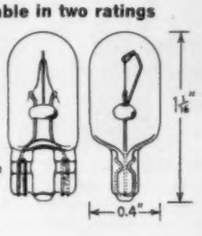
The Wedge Base saves space because, with its holder, it is considerably smaller than the old #57. It saves money because the holder and total installation costs are less. It saves time because the holder is easier to install and the lamp can be seated with just a push. And it saves manpower because installation can be automated and holders can be molded into plastic circuits. The G-E Wedge Base lamp can withstand ambient temperatures up to 600°F because it has no basing cement.

A major automobile manufacturer is already using G-E Wedge Base lamps; they're available in mass quantities. For more information write: General Electric Co., Miniature Lamp Department M-12, Nela Park, Cleveland 12, Ohio.

The Wedge Base is available in two ratings

G.E. Lamp No.	158	159
Circuit Volts	12	6.3
Amperes	0.24	0.15
Design Volts	14	6.3
Rated Av. Life at design volts	500 Hrs.	•
Filament	C-2V.	C-2R
L.C.L.	½"	½"
Bulb	T-3¼	T-3¼
Base Type	Wedge	Wedge
Candlepower	2	.35

*In excess of 5000 hrs. at 6.6 volts



Progress Is Our Most Important Product

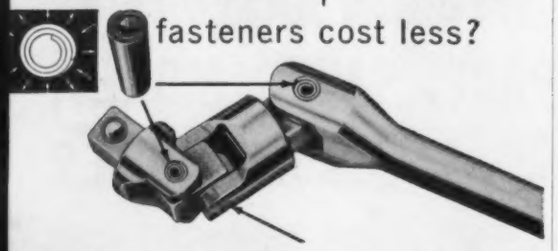
GENERAL ELECTRIC

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Why do

SPIROL *the true spring* **PIN**

fasteners cost less?



1. 80% of spring pin applications only require Medium Duty SPIROL PINS, which cost less.
2. Even the Heavy Duty SPIROL PINS in this socket-wrench universal joint don't cost more than other types of spring pins.
3. Assembly costs are lowered with SPIROL PINS! Just drill the hole (plus and minus tolerances allowed only by SPIROL PIN) and drive the pins—automatically or by hand.
4. Medium and Light Duty SPIROL PINS replace more costly fasteners, even in materials where other spring pins cannot be used. Come in Miniature Diameters, too: 1/32" to .052".

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NGINEERING &
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OMPANY, INC.





Write for free TECHNICAL DATA MANUAL. Free samples for specific applications.

C. E. M. COMPANY, INC.
42 School Street, Danielson, Conn • PRescott 4-8571

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1 out of hundreds of uses for

Waters

Torque Watch Gauges

TESTING TAKE-UP TORQUE OF 8MM MOVIE PROJECTOR

(Photo courtesy of Ansco, a division of General Aniline & Film Corp.)



MEASURE, RECORD LOW TORQUE IN SECONDS!

Check torque of rotating machinery, gear trains, magnetic clutches, small motors, dials, springs, potentiometers, variable condensers, servo mechanisms, tuning mechanisms, and hundreds of other devices within ±5% (±2% on special order) without expensive lab set up! Direct reading. Bi-directional, clockwise, counterclockwise models! Records highest torque applied! .005 to 40 oz./in. and 2 to 2800 gm./cm. Write for bulletin TW-160.

Waters

WATERS MANUFACTURING, INC. • WAYLAND • MASS.

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High-Temperature Insulation

350

A pure carbon material has both thermal-insulation and erosion-barrier applications. "Hitco-C" is made in both fiber form and in fabric rolls 33 inches wide and 50 yd or more in length. The characteristics of greater length and a stronger material make this fabric good for coating operations. Warp breaking strength is reported to be 25 lb-in or greater. Molded and laminated parts demonstrate excellent physical properties. The insulation also has industrial applications such as filters for corrosive liquids and vapors, electrical insulation, and in dry, nonlubricated bearings, gaskets and packings. The carbon product has the further advantages of economy, availability in production quantities and uniform quality.

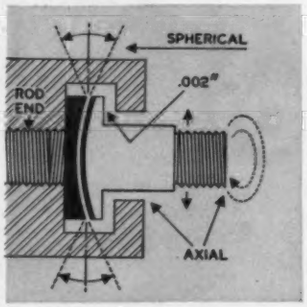
H. I. Thompson Fiber Glass Co., 6043 Hollywood Blvd., Hollywood 28, Calif.



NEW

SELF-ALIGNING ROD END COUPLER

Spherical movement (on push only) and axial movement provide precision alignment between cylinder and machine. Couplers shipped with .002" clearance between floating head and shoulder of retaining nut.





- Reduces cylinder bearing wear caused by side loads and binding
- Compensates for machinery deflection due to weight shifts
- Saves cost and time of custom-designing special assemblies
- Allows greater machinery tolerances
- Simplifies machine installation, either OEM or on the job
- Fits all air and hydraulic cylinders built to industry standards
- Male or female couplings. Female thread mates with standard style No. 2 cylinder piston rods
- Immediate delivery from stock of couplers for ⅝, 1, 1⅜, 1¾, 2, and 2½-inch diameter rods. Also available for 3, 3½, 4½, and 5½-inch rods.

HYDRO-LINE HL

5603 PIKE ROAD, ROCKFORD, ILLINOIS manufacturers of: high- and low-pressure hydraulic cylinders • heavy-duty air cylinders • adjustable-stroke cylinders • dispensing cylinders • intensifiers • single-acting cylinders • booster cylinders

Circle 81 on Reader-Service Card for more information

Dry Lubricant **351**

A release agent and dry lubricant, GS-3 is suitable for molding, casting, laminating and foaming applications, particularly with plastics and thermoplastics. The material is clean, dry, nonoily, nonstaining and dries almost instantly without application of heat. Most important, it does not build up in the mold. During laboratory tests, it was discovered that the material was also a superior invisible lubricant, with twice the efficiency of lubrication as graphite, yet was clean, unaffected by oils, water and most chemicals. Sprayed on cutting tools, closures, bearings, bushings or even moving parts of instruments, GS-3 acts as a lubricant. It can be brushed, dipped, sprayed or wiped.

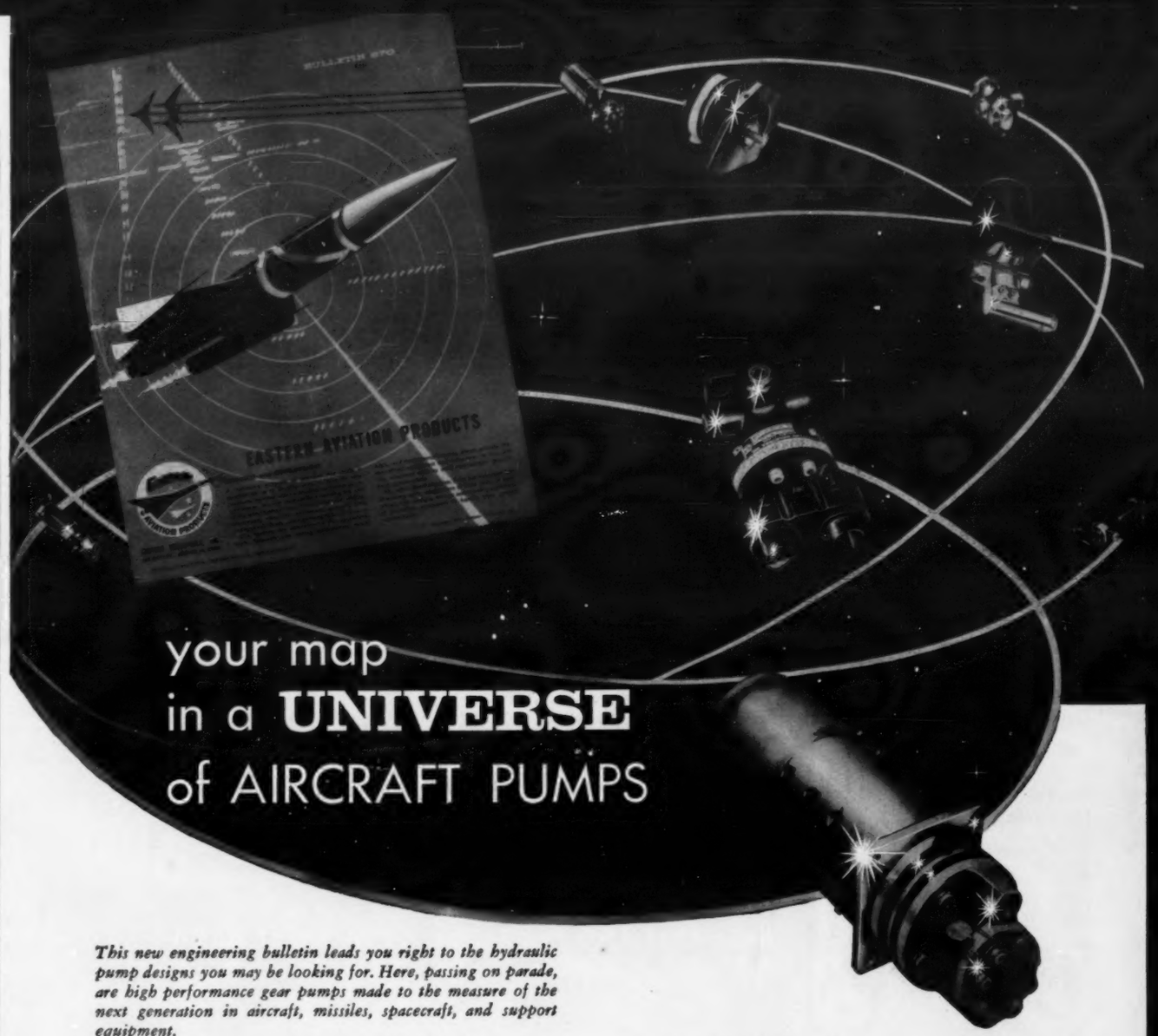
RAM Chemicals, Inc., Gardena, Calif.

Waterproof Foam Adhesive **352**

Combining the best qualities of epoxies and rubber, "Visopox" is a 100-percent-solids material, containing neither water nor solvents, and is good for bonding polyethylene, polystyrene and polyurethane foam to themselves or to other surfaces. It is permanently flexible, nontoxic and will withstand temperatures of —80F. The same qualities are exhibited at elevated temperatures. The material can be used to adhere all types of foam insulation to ceilings and walls, grabbing instantaneously without need of structural support to hold insulation in place while curing. Compound has an open time of about 4 hr and will cure in 8 to 12 hr. The adhesive and coating is also good as a sealer and caulking compound. It has high adhesion to almost any surface, is odorless, white in color and lower priced than epoxies or thiokol sealers.

Adhesive Products Corp., 1660 Boone Ave., New York 60, N. Y.

Circle 82 on Reader-Service Card



your map
in a **UNIVERSE**
of AIRCRAFT PUMPS

This new engineering bulletin leads you right to the hydraulic pump designs you may be looking for. Here, passing on parade, are high performance gear pumps made to the measure of the next generation in aircraft, missiles, spacecraft, and support equipment.

Many of these units are the product of ready-made, mass-produced components that can be teamed into the precise configuration you need. Custom-designed pumps are also available.

All have in common these classic Eastern hydraulic pump characteristics:

SMALL SIZE: Eastern gear pumps are the smallest, lightest made. Airborne servo system pump shown delivers 1.5 gpm @ 1500 psig — measures only 1⅞" x 1⅞" x 2¾", weighs 9 oz.

WIDE PERFORMANCE RANGE: pumps available have theoretical displacement from .0016 to 1.30 cu. in. per revolution — flow from .025 to 9.6 gpm, pressures from 0 to 2000 psig, at speeds to 24,000 rpm. Weights with motor range from 1.5 to 8.5 lbs.

UNAFFECTED BY EXTREME ENVIRONMENTS: rugged, reliable Eastern units take loads to 50g in stride — shrug off temperature differentials to meet MIL specs.

EASTERN INDUSTRIES INCORPORATED

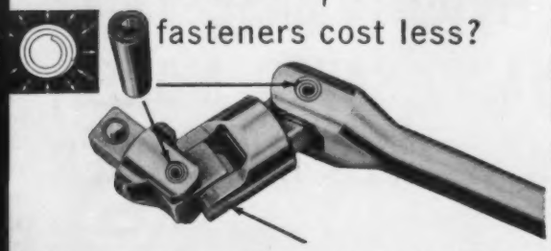
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Other Eastern products:
- **hydraulic motors**
- **servovalves, amplifiers, actuators and systems**
- **pressurization/dehydration packs**
- **quick-disconnect couplings**
- **electronic tube cooling units**

Why do

SPIROL *the true spring* **PIN**

fasteners cost less?



1. 80% of spring pin applications only require Medium Duty SPIROL PINS, which cost less.
2. Even the Heavy Duty SPIROL PINS in this socket-wrench universal joint don't cost more than other types of spring pins.
3. Assembly costs are lowered with SPIROL PINS! Just drill the hole (plus and minus tolerances allowed only by SPIROL PIN) and drive the pins—automatically or by hand.
4. Medium and Light Duty SPIROL PINS replace more costly fasteners, even in materials where other spring pins cannot be used. Come in Miniature Diameters, too: 1/32" to .052".





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C. E. M. COMPANY, INC.
42 School Street, Danielson, Conn • PRescott 4-8571

Circle 79 on Reader-Service Card for more information

High-Temperature Insulation

350

A pure carbon material has both thermal-insulation and erosion-barrier applications. "Hitco-C" is made in both fiber form and in fabric rolls 33 inches wide and 50 yd or more in length. The characteristics of greater length and a stronger material make this fabric good for coating operations. Warp breaking strength is reported to be 25 lb-in or greater. Molded and laminated parts demonstrate excellent physical properties. The insulation also has industrial applications such as filters for corrosive liquids and vapors, electrical insulation, and in dry, nonlubricated bearings, gaskets and packings. The carbon product has the further advantages of economy, availability in production quantities and uniform quality.

H. I. Thompson Fiber Glass Co., 6043 Hollywood Blvd., Hollywood 28, Calif.



1 out of hundreds of uses for

Waters

Torque Watch Gauges

TESTING TAKE-UP TORQUE OF 8MM MOVIE PROJECTOR

(Photo courtesy of Ansco, a division of General Aniline & Film Corp.)



MEASURE, RECORD LOW TORQUE IN SECONDS!

Check torque of rotating machinery, gear trains, magnetic clutches, small motors, dials, springs, potentiometers, variable condensers, servo mechanisms, tuning mechanisms, and hundreds of other devices within ±5% (±2% on special order) without expensive lab set up! Direct reading. Bi-directional, clockwise, counterclockwise models! Records highest torque applied! .005 to 40 oz./in. and 2 to 2800 gm./cm. Write for bulletin TW-160.

Waters

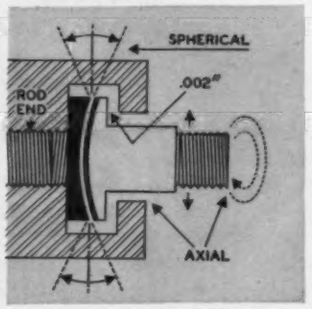
WATERS MANUFACTURING, INC. • WAYLAND • MASS.

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NEW

SELF-ALIGNING ROD END COUPLER

Spherical movement (on push only) and axial movement provide precision alignment between cylinder and machine. Couplers shipped with .002" clearance between floating head and shoulder of retaining nut.





- Reduces cylinder bearing wear caused by side loads and binding
- Compensates for machinery deflection due to weight shifts
- Saves cost and time of custom-designing special assemblies
- Allows greater machinery tolerances
- Simplifies machine installation, either OEM or on the job
- Fits all air and hydraulic cylinders built to industry standards
- Male or female couplings. Female thread mates with standard style No. 2 cylinder piston rods
- Immediate delivery from stock of couplers for ⅝, 1, 1⅜, 1¾, 2, and 2½-inch diameter rods. Also available for 3, 3½, 4½, and 5½-inch rods.

HYDRO-LINE HL

5603 PIKE ROAD, ROCKFORD, ILLINOIS manufacturers of: high- and low-pressure hydraulic cylinders • heavy-duty air cylinders • adjustable-stroke cylinders • dispensing cylinders • intensifiers • single-acting cylinders • booster cylinders

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Dry Lubricant **351**

A release agent and dry lubricant, GS-3 is suitable for molding, casting, laminating and foaming applications, particularly with plastics and thermoplastics. The material is clean, dry, nonoily, nonstaining and dries almost instantly without application of heat. Most important, it does not build up in the mold. During laboratory tests, it was discovered that the material was also a superior invisible lubricant, with twice the efficiency of lubrication as graphite, yet was clean, unaffected by oils, water and most chemicals. Sprayed on cutting tools, closures, bearings, bushings or even moving parts of instruments, GS-3 acts as a lubricant. It can be brushed, dipped, sprayed or wiped.

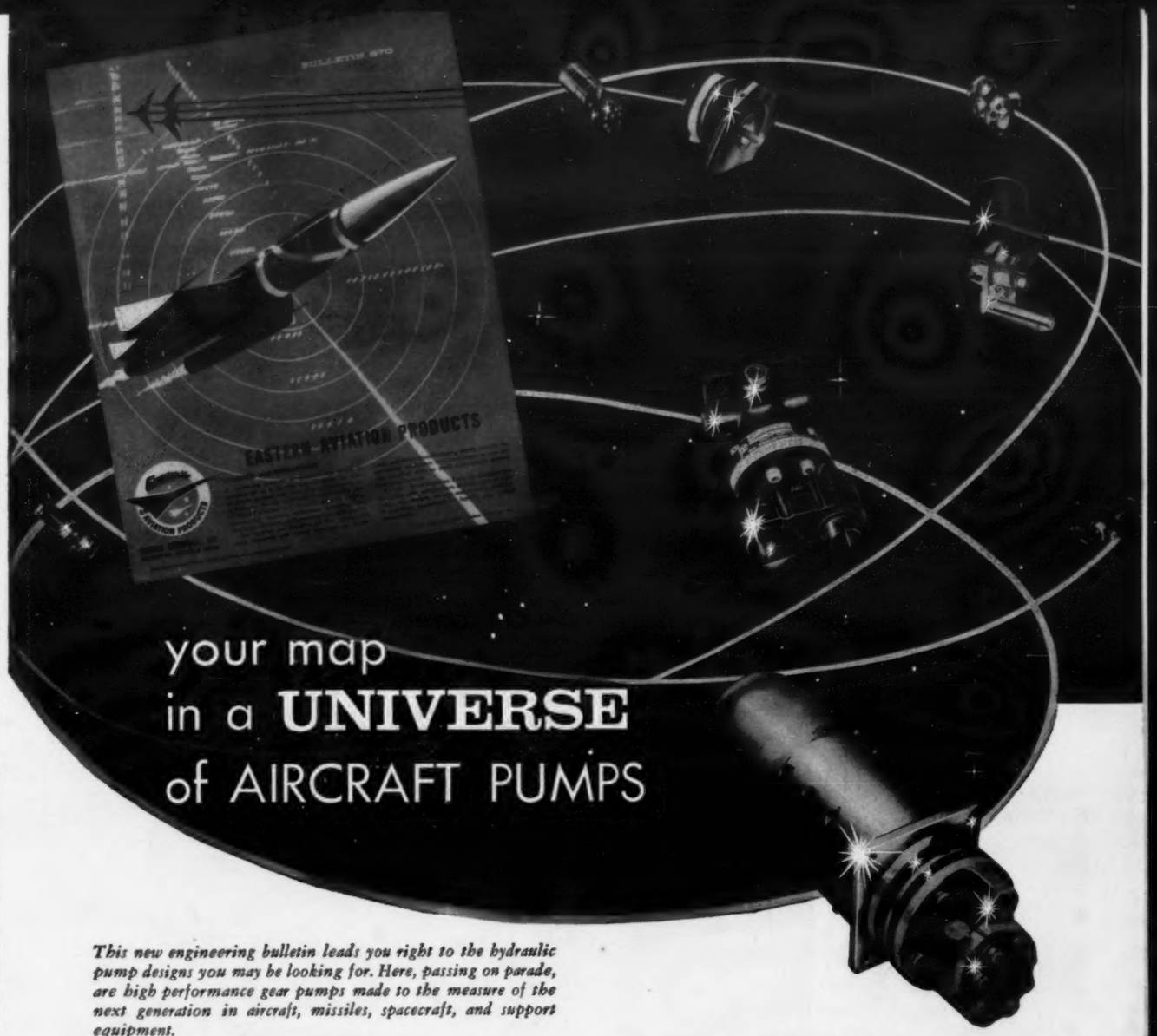
RAM Chemicals, Inc., Gardena, Calif.

Waterproof Foam Adhesive **352**

Combining the best qualities of epoxies and rubber, "Visopox" is a 100-percent-solids material, containing neither water nor solvents, and is good for bonding polyethylene, polystyrene and polyurethane foam to themselves or to other surfaces. It is permanently flexible, nontoxic and will withstand temperatures of —80F. The same qualities are exhibited at elevated temperatures. The material can be used to adhere all types of foam insulation to ceilings and walls, grabbing instantaneously without need of structural support to hold insulation in place while curing. Compound has an open time of about 4 hr and will cure in 8 to 12 hr. The adhesive and coating is also good as a sealer and caulking compound. It has high adhesion to almost any surface, is odorless, white in color and lower priced than epoxies or thiokol sealers.

Adhesive Products Corp., 1660 Boone Ave., New York 60, N. Y.

Circle 82 on Reader-Service Card



your map
in a **UNIVERSE**
of AIRCRAFT PUMPS

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Eastern AVIATION PRODUCTS

EASTERN INDUSTRIES INCORPORATED

100 SKIFF STREET • HAMDEN 14, CONNECTICUT
WEST COAST OFFICE • 4203 SPENCER ST. • TORRANCE, CALIF.

Other Eastern products:
- **hydraulic motors**
- **servovalves, amplifiers, actuators and systems**
- **pressurization/dehydration packs**
- **quick-disconnect couplings**
- **electronic tube cooling units**



EQUIPMENT

Precision Needle Files 353

A line of diamond needle files is well suited to extra-hard materials. Twelve different shapes in the conventional hand file design make up the line. The tools are available as slot files, machine files or mounted on a mandrel for use on hand filing machines. Three grits are offered: 200/240, fine, for polishing; 120/160, medium, for general utility use; and 80/100, coarse, for more rapid material removal. Diamond grains are bonded permanently to steel blanks to assure long life and economy.

Titan Tool Supply Co., Inc., 68 Comet Ave., Box H. Buffalo 16, N. Y.

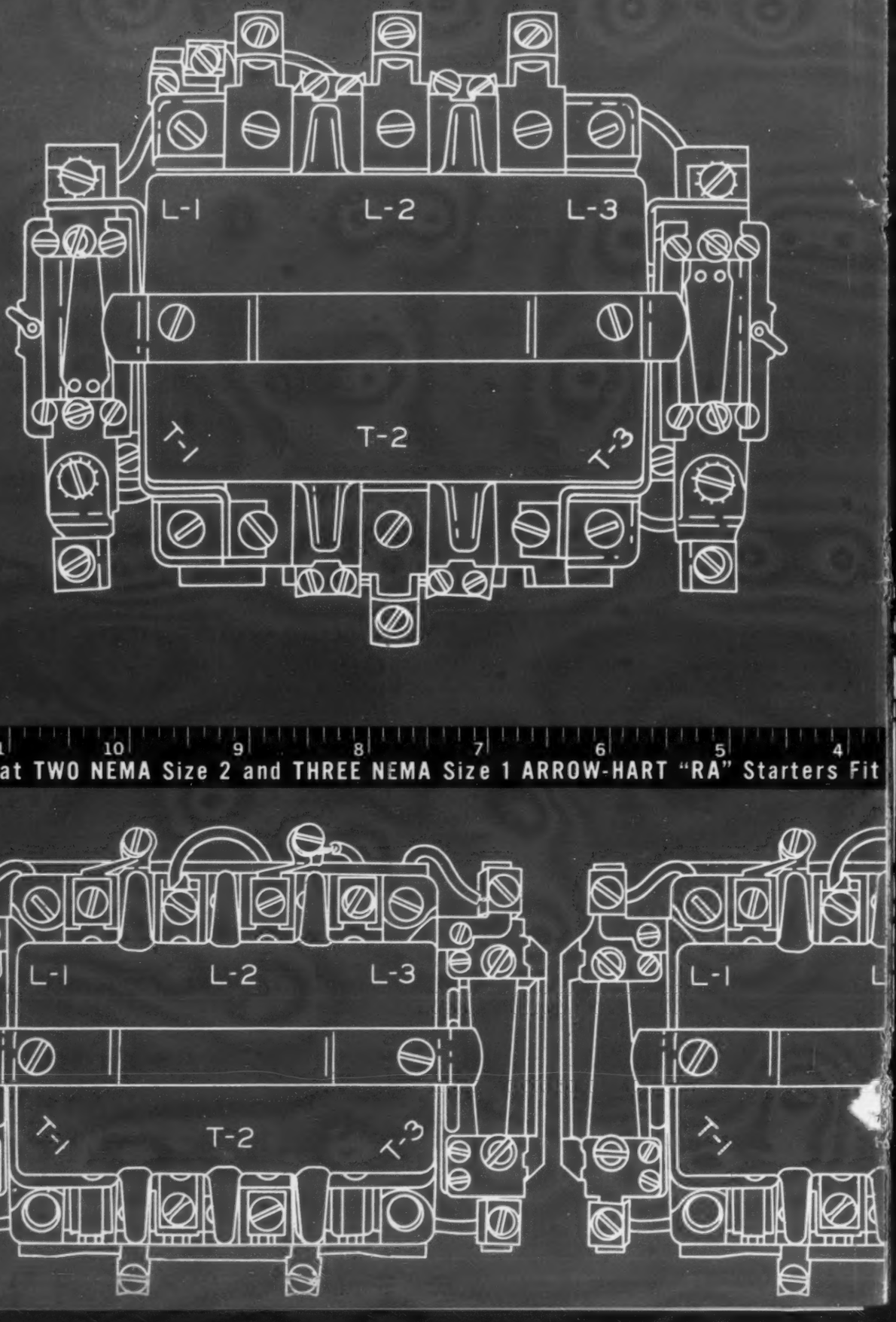
Parts Handling System 354



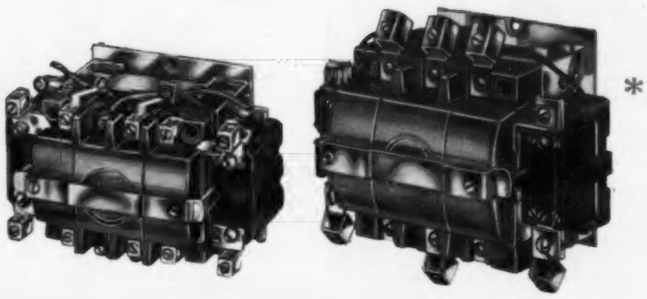
The V-100 Vacuum Tweezer facilitates quick and safe handling of tiny objects, delicate parts or subminiature components. Vacuum control is achieved by covering the bypass opening in pencil-shaped body with user's index finger. The system is engineered for continuous 110v a-c operation and has an adjustable electromagnetic vacuum generator. Aluminum body is connected to generator by rubber tubing. Stainless pickup needles of various sizes are included with each unit.

ANCO Products, 276 Park Ave., Collingswood 7, N.J.

Circle 83 for Reader Service



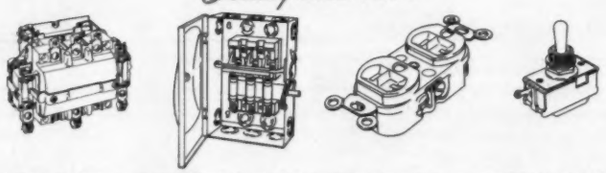
We went COMPACT 10 years ago!



Space-thrifty starters are not new . . . at Arrow-Hart! We've made this design for over 10 years. This means you buy 10 years' field-proven experience with each starter. Nobody else can offer you that. And nobody else can offer you an *AMBIENT COMPENSATED OVERLOAD RELAY that **Automatically** compensates for cold or heat from −20°F to +165°F. For the whole **compact** story, Nema sizes 00 through 5, write for Form A-262-R to The Arrow-Hart & Hegeman Electric Company, Dept. DN, 103 Hawthorn Street, Hartford 6, Connecticut.

ARROW AH HART

Quality since 1890



MOTOR CONTROLS • ENCLOSED SWITCHES • WIRING DEVICES • APPLIANCE SWITCHES

on these pages with room to spare!

Interchangeable Drawing Pens 355

Sets of one, three and four "Rapidograph" interchangeable drawing point sections are color-coded for identification of different point sizes (line widths). Point sections are nonclogging, easily cleaned and manufactured of a transparent material. Each has an airtight, individually attached, self-contained, reusable ink cartridge which can be filled easily. Set No. 3065-S4 contains sections in point sizes of No. 00, 0, 1 and 2. Model No. 3065-S3 has No. 00, 0 and 1 line widths. No. 3065-S1 is packaged singly with one drawing point section of any degree. Uses include drafting, ruling, guide and freehand lettering, tracing and commercial art work.

Koh-I-Noor, Inc., Bloomsbury, N.J.



Circle 83 for Reader Service

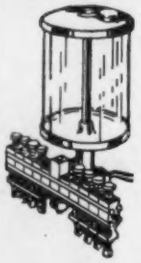
A COMPLETE LINE... for the finest in Automatic Lubrication

OIL-RITE
LUBRICATING EQUIPMENT



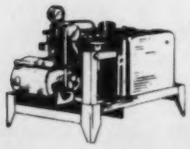
DROP FEED OILERS

Low cost, dependable lubrication. Drop feeding adjusted by needle valve. Any setting may be locked. Shut-off toggle starts or stops oil flow. Available in many models and capacities from ¼ oz. to 1 gal. with ⅛" to ½" pipe thread or for remote mounting.



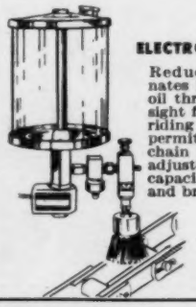
ELECTRO OILERS

Lubricates up to 24 points from single reservoir. Oil is fed by gravity to individually adjustable outlets. Solenoid connected across motor—oiling starts and stops with motor switch. Available in single or multiple feeds. Capacities 9 oz. to 1 gal.



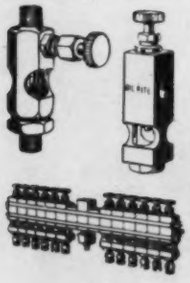
DISPENSERS

Feeds oil to elevated, distant and inaccessible points for dispensing through valves. Ideal for dusty and dirty surroundings. Air operated or motor driven gear pump circulating oiling system available in a wide range of sizes and tank capacities.



ELECTRO CHAIN OILERS

Reduces wear—eliminates hand oiling. Feeds oil through solenoid and sight feed valve to brush riding chain. Solenoid permits oiling only when chain moves. Drop feed adjustable. 9 oz. to 1 gal. capacity. Many styles and brush sizes.



SIGHT FEED VALVES

For any application requiring adjustable visible needle valve control. Friction screw retains hairline adjustments. Large vented sight chambers for observing oil flow. Many styles, single or multiple feed.



LIQUID LEVEL GAGES

Rugged construction, with glass or plastic sights, revolvable shields and guarded vent hole. Can be taken apart for installation in tight places. Many styles and sizes in both plain and shielded, elbow or straight types.

OIL-RITE offers you BETTER LUBRICATION...at BIG SAVINGS!

Looking for low cost oilers—automatic lubricating systems—ways to reduce costs and maintenance? You'll find the answers in the complete OIL-RITE line. OIL-RITE engineers with 25 years experience will gladly help you select the most suitable and economical model for your specific application. Consult us on your next requirements for lubricating equipment. There's no obligation.



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Oil Cups • Dispensers
Oiling Systems • Valves
Oil Gages • Chain Oilers

Oil-Rite CORPORATION
2331 Waldo Boulevard • Manitowoc, Wisconsin

Circle 84 on Reader-Service Card for more information

Citizens Band Transceivers 356

Featuring multichannel operation, this series of transceivers has an adjustable squelch control and a superheterodyne receiver with RF stage and 1750-kc IF strip. Choice of crystal or continuous receiving is offered, along with automatic "series-gate" noise limiter and press-to-talk microphone. Four-position front-panel switch selects one of four transmitting crystals. One position of the switch also connects a receiving crystal to give extra clear and steady reception. Three models offer variety of operation: Model 770 utilizes 117v a-c operation only; Model 771 has 117v a-c and 6v d-c operation, and Model 772 is for 117v a-c, 12v d-c operation.

Electronic Instrument Co., Inc., 33-00 Northern Blvd., Long Island City 1, N.Y.





AJAX ability to handle angular and offset misalignment totaling 7 degrees and more is preventing breakdowns, relaxing production tolerances, cutting assembly and maintenance costs. *Write for catalog.*

AJAX FLEXIBLE COUPLING CO. INC.
28 Portage Road Westfield, N. Y.
Incorporated 1920 *Representatives in Principal Cities*

Circle 85 on Reader-Service Card for more information

Precision Surface Gage 357

Scratches, grooves and other indentations on flat or curved surfaces may be measured for depth with this portable device. A precise, rapid and inexpensive means for determining either the depth of an indentation or the height of a raised portion of the surface, the unit finds application in the metal, plastic and photoengraving industries. Measurement may be made to an accuracy of ±0.0001 inch or 5 percent of the depth, whichever is greater, on indentations with a depth of from 0.0002 to 0.016 inch. Widths from 0.001 to 0.050 can be determined to ±0.001 inch. Similar range applies to measurement of raised portions. The "Scratch Depth Gage" is battery operated, with a transformer obtainable for use with 115v, 50-60 a-c power. Base of gage may be removed for substitution of special adapters. Knurled thumb wheel assures precise setting and eyepiece may be focused easily. Finish is light gray.

Bausch & Lomb, Inc., Rochester 2, N.Y.



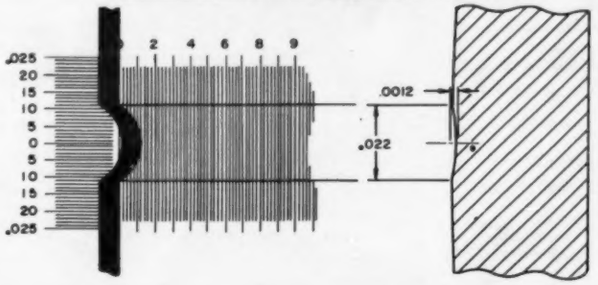
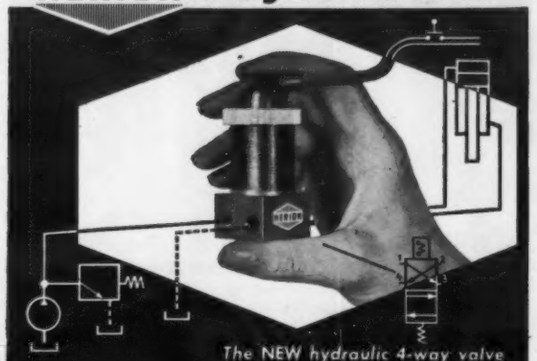


IMAGE OF SMALL-DIAMETER WIRE is projected at an angle against scratch to determine both depth and width of indentation or raised portion of surface.

HERION Midget Slide Valve



The NEW hydraulic 4-way valve engineered for increased efficiency with great savings of space, weight and maintenance.

ESPECIALLY DESIGNED for Clamping Operations, Latch & Lever Systems, Lubricating Systems, Feed Operations, Oscillating Motion Control and similar functions.

SPECIFICATIONS: Solenoid operated — 6, 12 or 24 Volt DC; Working Pressure — up to 1400 psi; Weight — 13 oz.; Pipe Size — ⅛" x 27 NPT; Built-in filter; Maximum flow volume — 1 GPM; Overall length including cap — 3½"; Width — 1⅜" square.

HERION INCORPORATED

At the Service of Automation

P. O. BOX 184 VALLEY STREAM, N. Y.

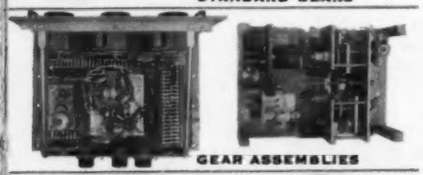
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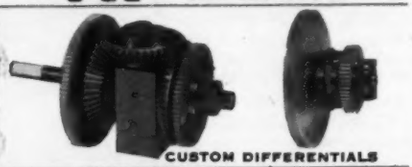
FOR YOUR PRECISION AND SPECIAL GEARING REQUIREMENTS . . . LOOK TO Arch











ARCH

IN PRECISION GEARING Arch Gear offers you a thoroughly skilled group of gear specialists operating the latest in gear cutting and processing equipment to produce to your specifications all types and classes of precision gears at low unit costs . . . . .

IN STANDARD GEARS, the facilities of Arch Gear are perfectly suited to augment your organization in the production of large commercial gears or close tolerance manufacture of special production-type precision gears . . . . . .

CUSTOM DIFFERENTIALS are a product of Arch Instrument, a separate manufacturing entity devoted to meeting the needs for space-age tolerances. With ten models from 1/16" to 5/16" in both hollow and solid shaft units, Arch offers you the most advanced line of differentials available. Assembly, testing, calibration and packaging is performed in a specially constructed white room to assure specified tolerances and performance.

IN GEAR ASSEMBLIES, another specialty of Arch Instrument, we offer you complete design and engineering assistance on gear trains and other servo gear assemblies. From a pilot model to a large number of production units, Arch is equipped to produce to exacting specifications as well as perform the assembly and testing of the complete electro-mechanical package . . . . . .

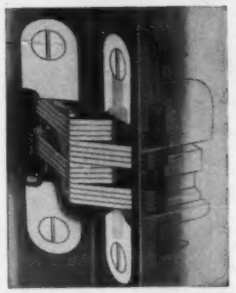
Why not investigate the gearing abilities of Arch? Write for complete information and literature today . . . . . .

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97 HOLMES STREET, NORTH QUINCY 71, MASS.
ARCH INSTRUMENT CO., INC.
101 HOLMES STREET, NORTH QUINCY 71, MASS.

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NEW INVISIBLE HINGES

General Purpose Hinge Creates Flush Surfaces



These hinges are completely hidden from view when door, lid or hood is closed. Makes possible flush, absolutely smooth surfaces that greatly enhance appearance and safety. Tapered body sections are precision castings of a special zinc base alloy having a tensile strength of 47,000 pounds per square inch. Operates in a 180 degree arc which permits full opening. Laminated link construction reduces friction and permits hinges to operate freely and smoothly. Hinges are reversible and may be used right or left hand. Available for wood or metal application in a wide variety of sizes.

SOSS MANUFACTURING COMPANY, Dept. DN-33, P. O. Box 38, Harper Station, Detroit 13, Michigan.

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50,000 HOURS

of silent, synchronous power assembled in every *

HANSEN SYNCHRON® TIMING MOTOR

Manufacture of long-life, Hansen SYNCHRON Timing Motors is quality-controlled throughout, to make them the *best* synchronous motors for industrial and commercial applications. Skilled, experienced workers assemble Hansen SYNCHRON motors to rigid standards. Each motor undergoes 51 separate tests and inspections before shipment, insuring users of the ultimate in silent, continuous, synchronous power for specific timing applications.

Operating efficiently in any position, self-starting, self-lubricating Hansen SYNCHRON Timing Motors deliver from 8 to 30 in./oz. guaranteed torque; at temperatures from —40 F to +140 F; in speeds from 600 rpm down to ½ rph; clockwise or counterclockwise rotation. Over 200 types of output available.

The efforts of Hansen engineers have been concentrated in just one area for over 50 years — creating and applying synchronous power units to timing applications. Use this experience to solve your specific timing problems. Contact your nearest Hansen representative, or write direct.

HANSEN REPRESENTATIVES:

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Los Angeles, Calif. (OLive 1-3220)
Oakland, Calif.

WINSLOW ELECTRIC CO.
New York, N. Y. • Chester, Conn.
Philadelphia, Penn. • Cleveland, Ohio

*An average figure for Hansen SYNCHRON Motors . . . many are designed for shorter life — others for years longer.

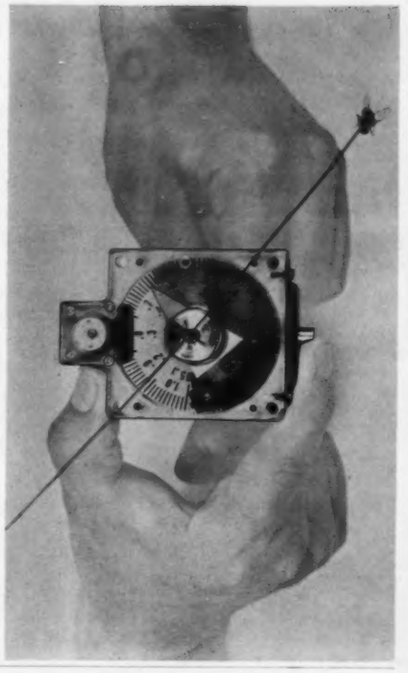


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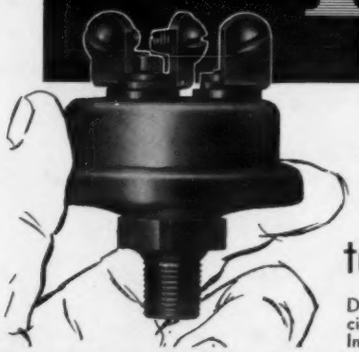
Torquemeter **358**

A low-cost method of comparing relative torque values of ball bearings is provided by the No. 781 GM-CM "Torqmeter". Though sensitive enough to record the weight of a fly, the unit delivers accurate readings involved in rotating torques of miniature servomotors, gyros and hairsprings. Full scale ranges are 1, 2 and 5 GM-CMs, enabling 3-percent accurate readings from 0.1 to 5 GM-CMs at speeds to 10,000 rpm. The torquemeter's ruggedness yet acute sensitivity result from its design which permits pointer shaft to move but not rotate on miniature ABEC-7 ball bearings. Static and slow torques are read directly; torques over 100 rpm are read with the aid of a strobe light synchronized with the dial. Meter is made of clear molded plastic. Scale is 325 deg, 5-1/2 inches long. Graduations permit torque and degree of deflection to be read simultaneously.

Power Instruments, Inc., 7352 N. Lawndale Ave., Skokie, Ill.



Hobbs DUAL CIRCUIT PRESSURE SWITCHES



Add a NEW DIMENSION to Pressure Activation!

DOUBLE DUTY! Disconnects one electrical circuit while placing the other in operation. Industry-approved for a wide range of applications in dual circuit activation of various types of instruments, warning signals, safety devices, fuel pumps — in many other ways for making and breaking circuits. Ideal for locking out a starting motor while the engine is running. Can be used with oil or air . . . or with standpipe, almost any liquid or gas.

- Non-ferrous pressure chamber
- Phosphor-bronze diaphragm
- Alloy contacts • Preset at factory

Available in pound setting specifications in both circuits within ranges of 3-6, 7-14 and 15-60 psi. Compact — only 1-11/16" diameter. Pressure assembled and pretested at 150 psi. Designed for use on direct current.

A COMPLETE LINE OF PRESSURE SWITCHES

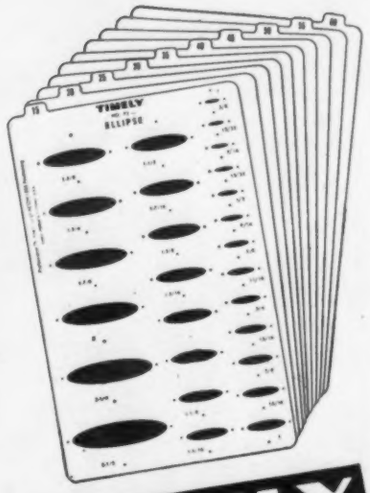
Also available — a wide selection of single circuit pressure switches. Built by the manufacturers of Hobbs Running Time Meters and Shock-Mounted Head Lights. Distributors in principal cities . . . Write for CATALOG PS605



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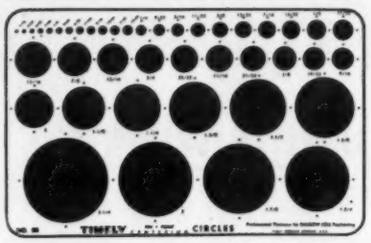
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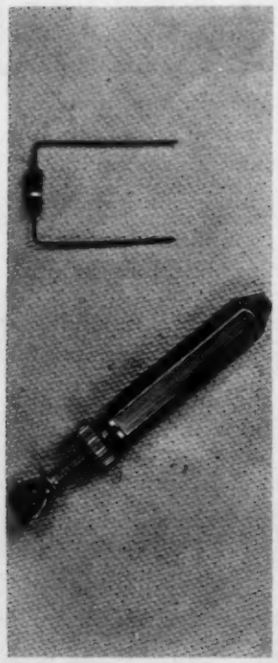
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Automation, Inc., 212 Worchester St., Wellesley Hills 82, Mass.

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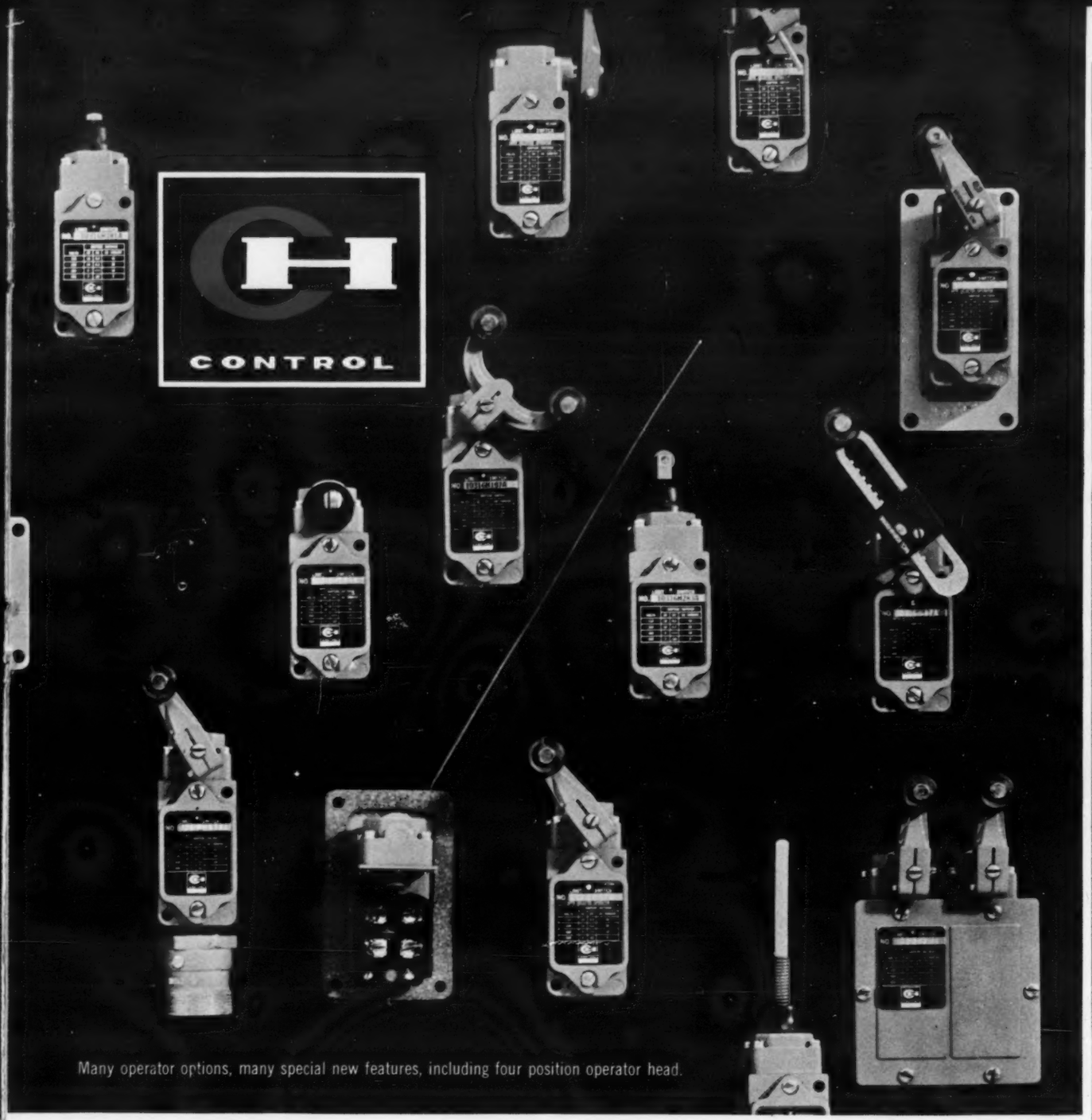


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CONTROL

EQUIPMENT

Semiconductor Kit 361

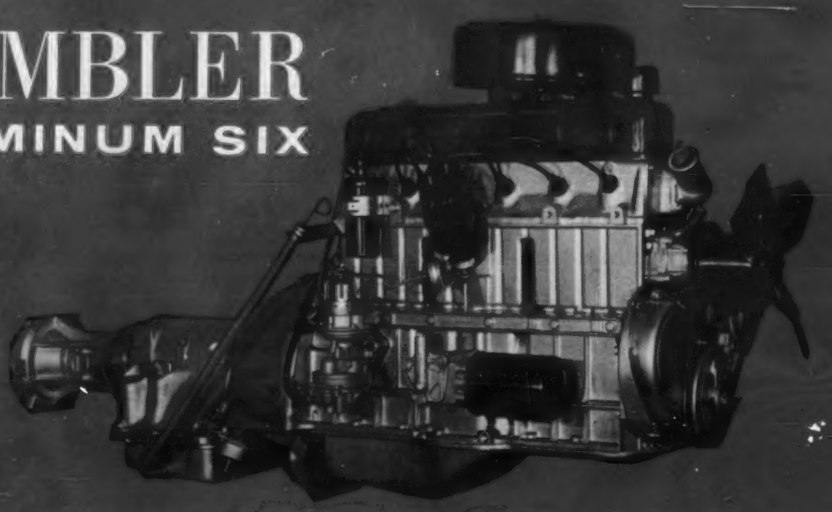
A designer's kit aids in solving the problem of cooling power semiconductors as power increases and space/weight limitations decrease. Representative types of semiconductor coolers are contained in the kit, including natural-convection units and forced-convection modular package. Both modular components and complete units enable the designer to conduct tests using his own circuitry within the physical layout and environment of his choosing. Technical data for each model is supplied, as well as a handbook outlining theory and practical techniques for temperature, power and air-flow measurement.



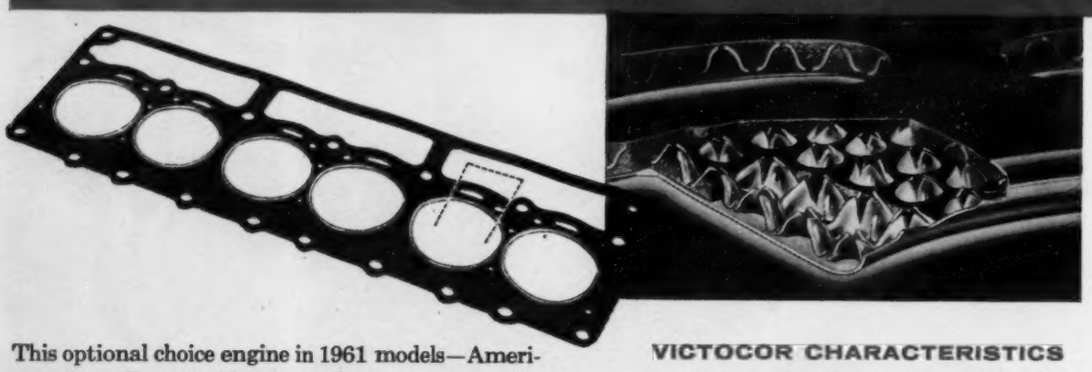
Wakefield Engineering, Inc., Delta-T Semiconductor Cooling Div., Wakefield, Mass.

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sealed with Victocor®



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A VICTOCOR cylinder-head gasket seals this fine engine. VICTOCOR's superior compressible and resilient sealing properties are combined with a stainless steel bottom layer that provides maximum heat and corrosion resistance.

VICTOCOR's exclusive metal core-Asbestopac* construction dissipates heat build-up . . . reduces torque loss . . . and maintains dimensional stability. The Asbestopac component retains all coolants.

*Synthetic rubber-asbestos sheet packing

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WRITE FOR CATALOG NO. 505A

Available in standard type and modified structures, VICTOCOR gaskets have wide adaptability for automotive and industrial machinery sealing. Consult your Victor Field Engineer, or write on your business letterhead for catalog on VICTOCOR and other superior packings. Victor Mfg. & Gasket Co., P.O. Box 1333, Chicago 90, Illinois. Canadian Plant: St. Thomas, Ontario.



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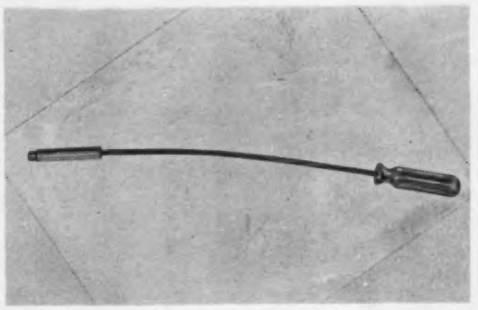
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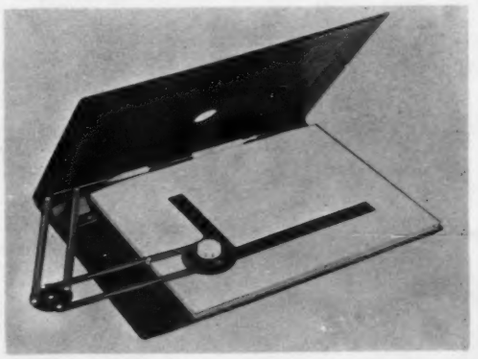
Magnetic Retriever 362



This magnetized device picks up all ferrous metals, washers, fasteners and parts, including small tools such as wrenches, pliers and screwdrivers. Slender shaft of tightly wound flexible coil permits flexing of the unit to get around corners and other obstructions. Strong "Alnico" V-magnet is 3/8 inch in dia. The retriever has an overall length of 18 inches. Handle is plastic.

Safety Vacuum Lifter Co., 321 Elm St., Trenton 10, N.J.

Drafting Kit 363



Mounted in a vinyl self-locking binder, this drafting instrument combines advantages of a T-square, triangle and protractor. The anodized-aluminum device has a 3- by 5-, or 4- by 6-inch scale and a 180-deg protractor. All parts are machine-calibrated. Contained in the portfolio with the drafting instrument are a drawing pencil and 50 sheets of drawing paper. The "Draftette Sketch Kit" measures 9-1/2 by 1-1/2 by 13 inches, weighs 1-1/2 lb and finds uses wherever a portable drafting unit is required.

Draftette Co., Box 794, Beverly Hills, Calif.

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Groove-Joint Pliers 364

Addition of two new pliers expands the manufacturer's line of groove-joint tools. Latest models are a 16-inch long plier with 4-inch capacity and a 6-1/2 inch-long model with 1-inch capacity. Five nonslip parallel openings increase usefulness. Unusually long handles supply needed leverage when maximum gripping is required. Noncorrosive and nonmagnetic, the tools meet military specifications and are suited for marine, aircraft, industrial and automotive applications.

Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 1, Wis.

Radioactive Samples 365



Problems in preparing reproducible radioactive samples have been greatly simplified by a sample preparation set. Model PM-5 employs a newly developed filtration device called a chimney funnel which contains a porous stainless-steel filter disc. Solution is suction-filtered through chimney funnel and a uniform layer of sample is deposited to dry on the steel disc. The operation produces samples in a few minutes and requires a minimum of skill. Included with the funnel are 12 reusable discs, four plastic safety syringes, a spatula, a tube of 65 copper sample pans, a jar of filter aid and a bottle of emulsifier.

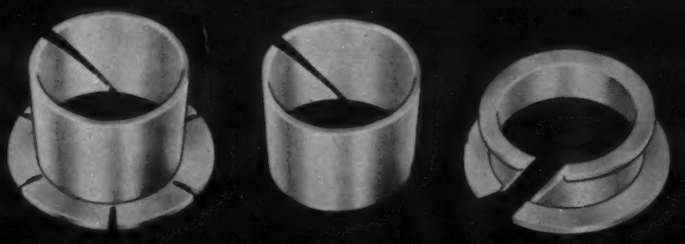
Nuclear-Chicago Corp., 359 E. Howard Ave. at Nuclear Dr., Des Plaines, Ill.

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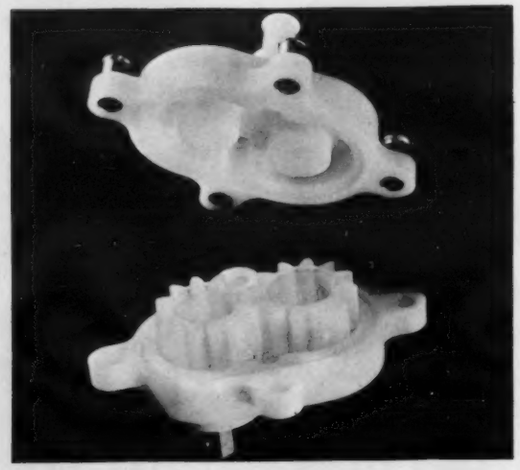
DEPT. 2, MANHASSET, NEW YORK

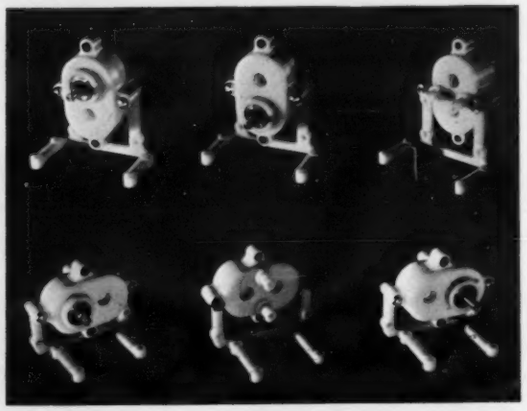
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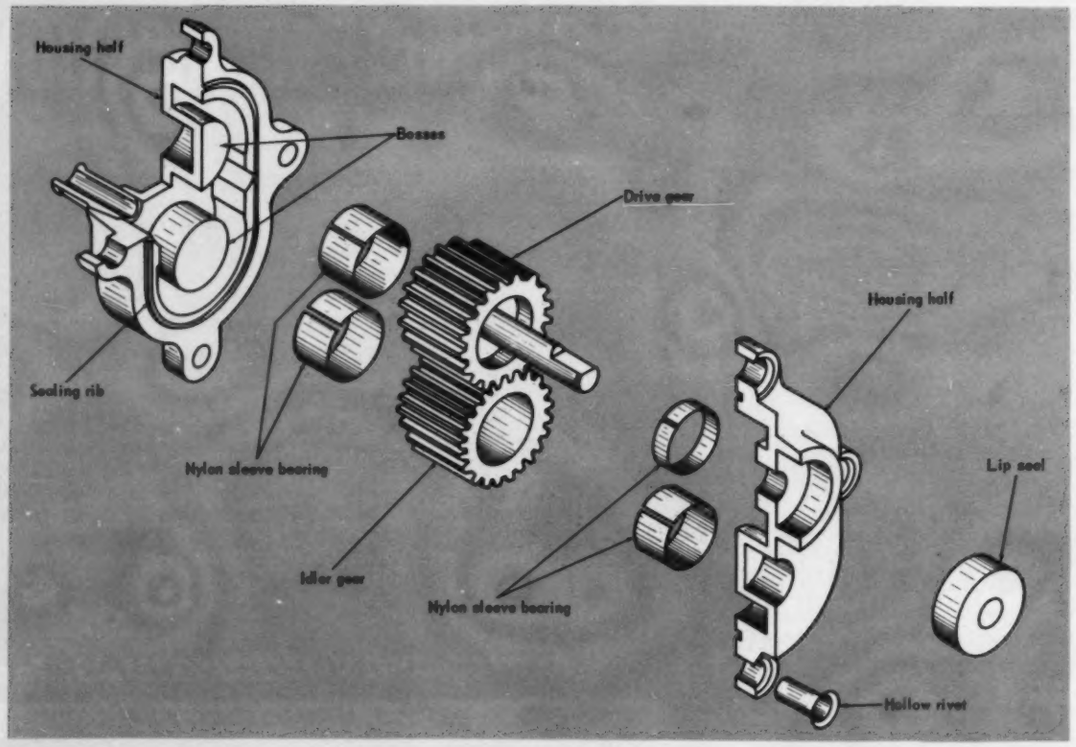
Molded Bosses Locate, Support Gears in Small 'Delrin' Pump

Lars G. Soderholm, Midwest Editor





MOLDED BRACKET accommodates pump in eight possible basic positions, six of which are shown.



A small, low-pressure gear pump, specifically designed to be made of molded parts for maximum performance with minimum cost, uses close tolerance molded bosses in each housing half-section. These bosses determine the location of the gears and provide necessary bearing support.

In the planning stage, a pump with small physical dimensions was envisioned as delivering small quantities of fluid (one gpm or less) at low pressures. The design, it was decided, should offer working efficiencies at least equal to if not better than those of competitive-sized pumps. Finally, the pump had to be made in such a manner that unit cost would be $5 or less.

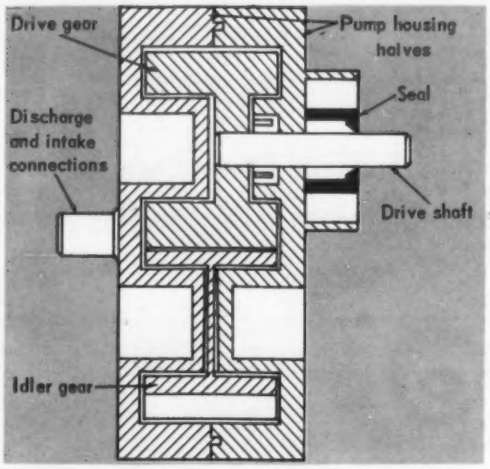
For the sake of economy, molded "Delrin" (registered trademark of du Pont) parts were selected because of their good physical and corrosion-resistant properties and because technical know-how needed to mold to close tolerances was available. The gear pump housing is made in two halves—each having two bosses projecting from its internal surfaces. These bosses are molded as true cylinders and are held dimensionally both in diameter and in length. A nylon sleeve bearing slips over the bosses to provide a low-friction bearing surface for the pump gear.

The spacing of the molded bosses determines the gear spacing for proper tooth engagement. The bosses, projecting deep into the pump gear bore from either side, provide a large bearing area and also take loads transmitted from the gears.

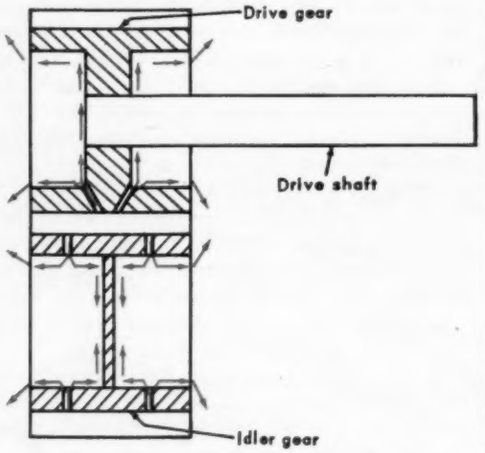
Sealing the pump housing sections is accomplished through a molded seal rib in one half that fits into a groove in the other half. The projecting rib is slightly higher than the groove is deep, so the rib fills the groove as the sections are joined. The pump drive shaft leaves the housing through a cavity which holds either a lip seal or a bearing and a seal. The lip seal design determines the pressure rating of the pump.

Pump efficiencies are surprisingly good. Very little power is required to operate the pump (compared to similar-sized metal pumps) and the pump will prime when the drive shaft is spun between the fingers.

The "Delrin" gear pump is manufactured by the Coy Manufacturing Co., Chicago, Ill.



HIGH OPERATING EFFICIENCIES are gained through use of large-diameter, thin-walled bosses. Large diameters provide large bearing areas for better load distribution. Thin wall sections in bosses provide better heat transfer through "Delrin" material and greater exposed cooling area.



PUMPED FLUID lubricates bearings through ports drilled in gears. High-pressure fluid, squeezed from spaces between meshing gear teeth, flows in area between boss and gear. This tends to float gears to provide longer bearing life and better sealing.

PUMP TESTS*					
Motor:	1/8-hp single-phase 115v 60-cycle a-c 1725 rpm				
VOLTS	WATTS	AMPS	RPM	FLOW Quarts	Seconds
115	100	2.30	1750	3	60
Under full load. Minimum start 95v. Cold resistance 4.231 ohms.					
Motor:	1/20-hp 115v shaded-pole 1550 rpm				
115	130	2.	1620	1	20.5
Under full load. Minimum start 85v. Cold resistance 7.385 ohms, hot resistance 10.99 ohms.					
* Room temperature ambient 78F; tap water 78F					

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Gasket engineering

HEAT FLOW in GASKETED JOINTS

Transmission of heat through gasketed joints is undesirable in many applications. Here are suggestions for reducing it.

E. M. SMOLEY Research Physicist, Armstrong Research and Development Center

The problem of heat transmission in gasketed joints has recently been intensified by the trend toward smaller, more compact designs.

A typical example is found in some small gasoline engines where the fuel tank is located above the combustion chamber, separated only by a resilient gasket. This is illustrated in the diagram at the right. Heat enters the bottom of the flange, and the problem is to minimize the flow of this heat to the top flange.

Armstrong research engineers recently studied the mechanics of the heat transfer problem in applications of this kind. As a starting point, they calculated the thermal conductivity ("k" factor) for each class of Armstrong gasket materials. The values are listed in the box below.

THERMAL CONDUCTIVITY VALUES FOR GASKETS

ARMSTRONG MATERIAL	Thermal conductivity k_{TC} $\frac{\text{Btu-in}}{\text{hr-ft}^2\text{-F}^\circ}$
Cork compositions	0.34 to 0.49
Accopac cellulose fiber materials	0.55 to 1.17
Cork-and-rubber compositions	0.79 to 1.32
Accopac asbestos fiber materials	1.16 to 1.58
Synthetic rubber	2.22

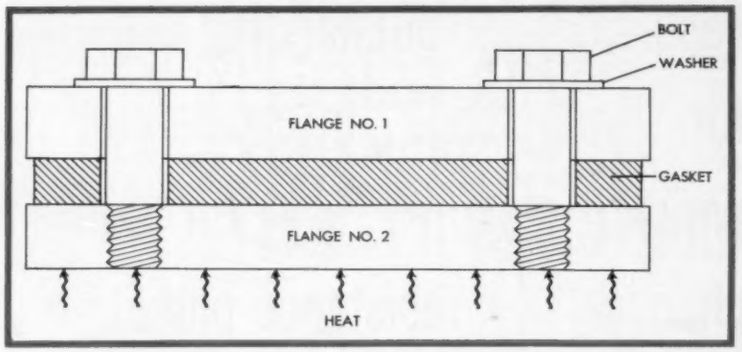
As the table shows, all the tested gasket materials have relatively low "k" factors, ranging from 0.34 to 2.22, and thus are good insulators relative to the metal parts of a flange assembly. The "k" factor of aluminum and its alloys, for example, ranges from 612 to 1548; of carbon steel, from 313 to 360; and of stainless steel, from 104 to 165. With the "k" factors of each element known, it is possible to calculate the amount of heat transferred by conduction, using the basic heat flow equation:

$$\frac{Q = k\,A\,(t_2 - t_1)}{d}$$

In this, "Q" is a measure of heat flow per unit time; "k" is the thermal conductivity; "A" is the area of the gasket. The difference t_2 minus t_1 is the temperature difference across the thickness of the gasket; "d" is the compressed thickness of the gasket.

The total heat flow is the sum of that which passes through the gasket and the bolts, and separate calculations must be made for each.

Normally, of course, most of the conducted heat moves through the bolts, since they are the only metal-to-metal contact. If aluminum bolts are used, heat flow could be reduced by roughly one-third by substituting carbon steel. Stainless steel bolts would reduce it still more.



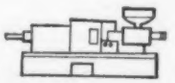
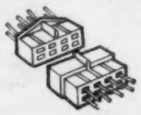
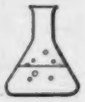
To further reduce transfer through the bolts, it is suggested that flat washers be die-cut from heat-resistant Armstrong materials (Accopac AN-890 or N-852) and placed between the metal washer and the flange. These should help to insulate the bolts.

Although no one recommendation can be made that will solve every heat transfer problem, the Armstrong studies indicate several general directions in which to proceed: (1) give preference to gaskets having the lowest thermal conductivity; (2) use the thickest gasket possible; (3) examine the possibility of changing to metals having a lower "k" factor in flange-bolt construction; (4) keep the gasket area as small as possible; (5) try insulating the bolt by using a washer cut from Accopac AN-890 or N-852.

If you have a specific problem related to heat transfer, we will be glad to make suggestions if you will submit details to us. Write to Armstrong Cork Company, Industrial Division, 7109 Ithaca Street, Lancaster, Pennsylvania.

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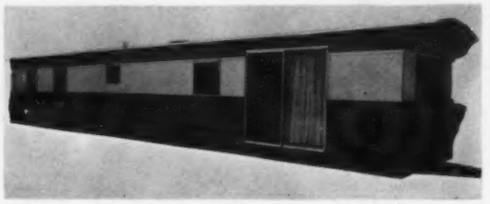
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Stressed Frame Reduces Deflection in Mobile Home

Edward W. Schrader, Western Editor



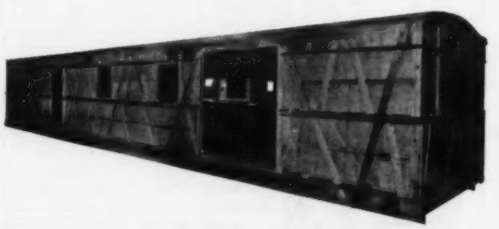
MOBILE HOME has double insulated sidewalls and floor with triple insulated ceiling. Exterior is 0.019-inch aluminum skin. Unit is 50 ft long by 8 ft hgh by 10 ft wide.

A mobile home uses a stressed frame construction and laminated floor joists to distribute both the live and dead loads. Conventional construction uses a long steel chassis and a stressed skin or wall of plywood to distribute the same loads. The major design problem in mobile home construction is deflection at the extreme ends, furthest from the wheels.

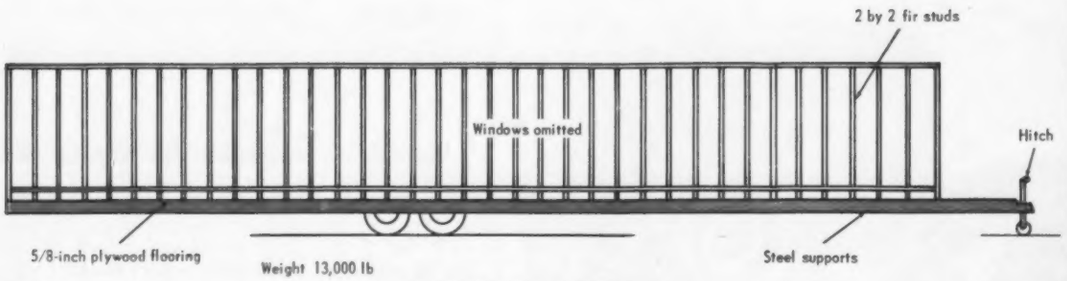
Deflection causes cracking and loosening of joints, which in turn shorten the life of the product. Conventional mobile-home design uses an eight-inch steel channel chassis to reduce the deflection, although the sidewalls carry the load. Floor, sidewalls and roof then are erected in a pattern typical of home construction.

A truss design using 1- by 4-inch Douglas fir framing and laminated floor joists on 19.2-inch centers provides a more rigid construction for the same weight of materials.

The stressed frame is used in the Travois mobile home manufactured by S & S Steel Products, Inc., Compton, Calif. Design is by Industrial Design Affiliates, Beverly Hills, Calif.

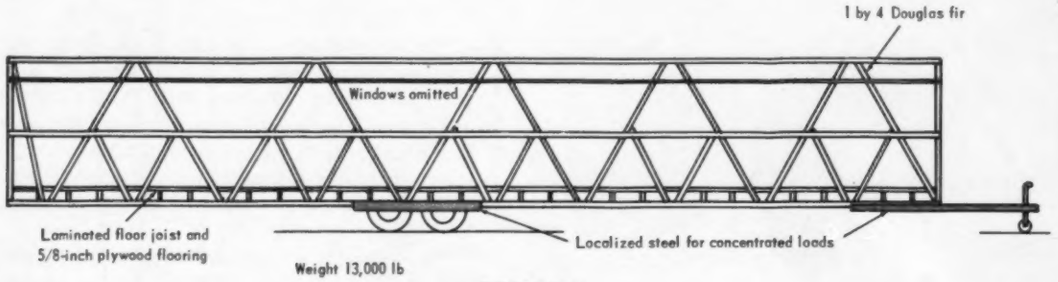


TRUSS FRAME JOINTS are joined with phenolic resin glue and three No. 12 wood screws. Interior wall is 3/8-inch sheet rock (dry wall) nonload-bearing material. Battens insulate walls, ceiling and floor.



CONVENTIONAL DESIGN

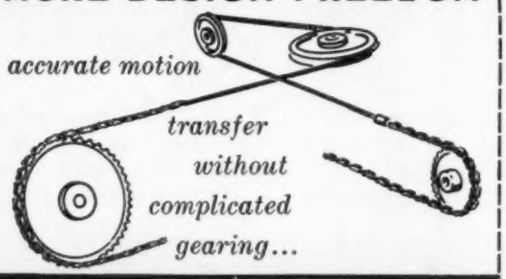
CONVENTIONAL CHASSIS and stressed skin wall construction use 2- by 2-inch Douglas fir vertical studs, 16 inches on center, with 3/16-inch plywood paneling to increase longitudinal tie.



REDESIGN

STRESSED FRAME CONSTRUCTION uses 1- by 4-inch Douglas fir truss to serve as both longitudinal and vertical ties. Structural steel is localized for concentrated loads at wheel and hitch.

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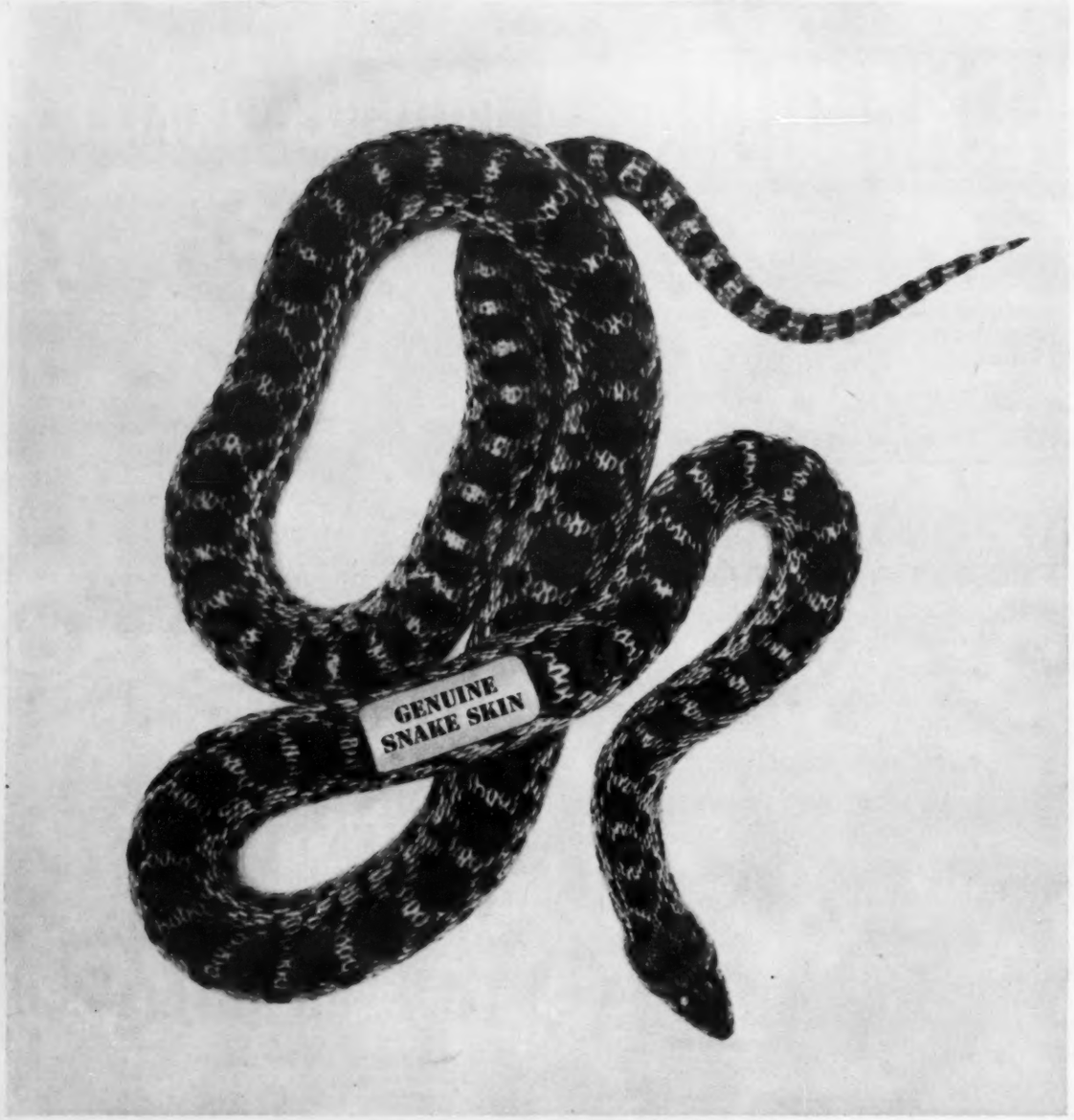
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Lightweight 'Dylite' Ball

Lars G. Soderholm, Midwest Editor

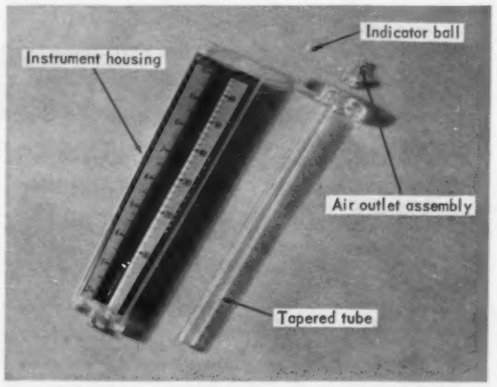
An economical hand-held wind meter makes use of a low-density, expandable polystyrene ball that operates in a molded tapered acrylic tube. By holding close tolerances and through exact orifice diameters, indicating accuracies of $\pm 1/2$ mph on the low 2- to 10-mph scale or ± 3 mph on the high 0- to 66-mph scale are possible.

The construction of this instrument was made possible through the use of tiny "Dylite" (Koppers) polystyrene indicating balls. With a density of 2 lb per cu ft, this material is lighter than cork. It is purchased in spherical form after which it is screened twice—once for size (0.0450 to 0.0465 inch dia) and another time to check each sphere for roundness.

The orifice tube and instrument housing is die-molded from DuPont HM-140 acrylic plastic. This high-temperature material offers good stability and is rugged enough to provide portability for either sea-going or sports usage.

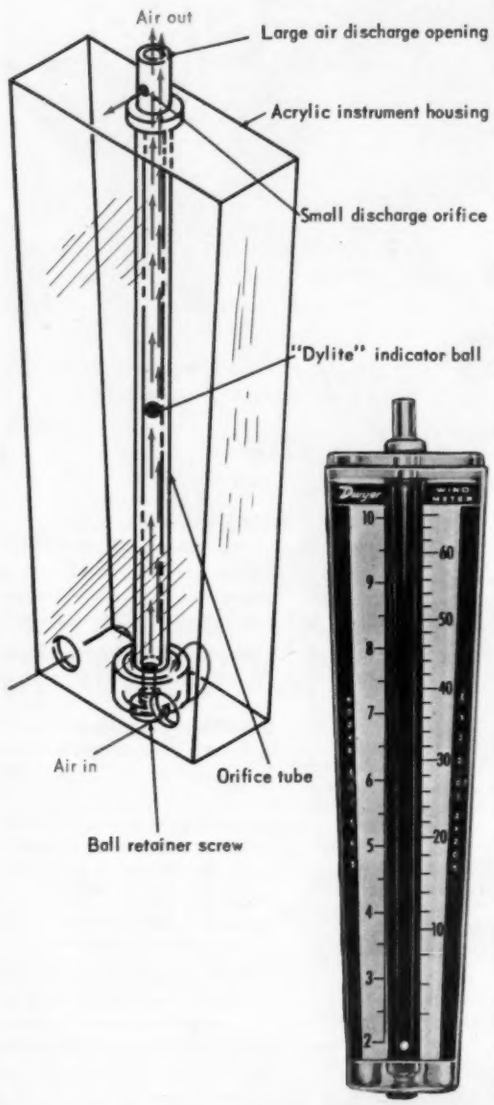
Each instrument contains two measuring scales. As normally held, the wind meter gives low-scale readings. When the major air-discharge port projecting from the top of the instrument is covered with a finger, only the small orifice remains open which shifts the instrument's readings to the high scale.

The wind meter is available in models which measure either up to 55 knots or 66 mph and is designed to sell for less than $5. It is made by the F. W. Dwyer Mfg. Co., Michigan City, Ind.

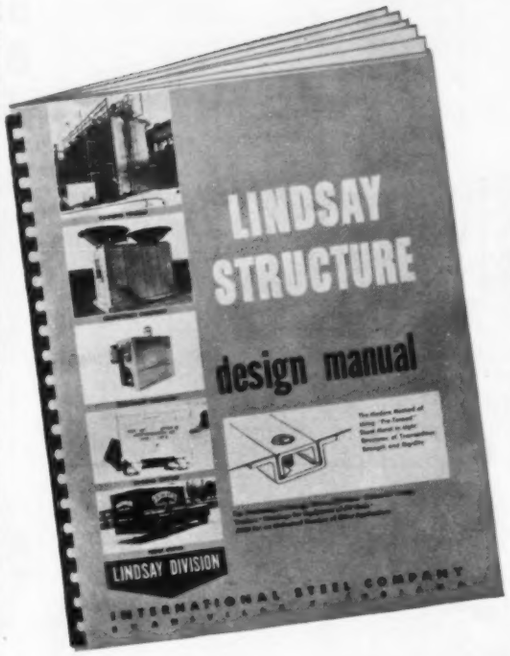


PLASTIC COMPONENTS allow economical production of relatively accurate wind-measuring instrument. Small "Dylite" indicating ball is contained in die-molded acrylic orifice tube located inside acrylic instrument housing.

Provides Response in Wind Meter



WIND-METER OPERATION requires two ports located in lower part of the instrument housing to be held facing into wind. Ports open to inside of housing which also contains restraining seat for lower end of orifice tube. Small polystyrene ball is held in orifice tube by projecting retaining screw. Flow of air lifts ball in tapered tube to position where weight of ball is supported. Adjoining metal scales permit direct wind-velocity readings. Air leaving tapered tube escapes through large top opening and small drilled orifice. With large opening covered, high-scale readings are obtained. With all openings uncovered, low-scale readings are obtained.



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DESIGN DATA NEWS

Helical Springs

Edwin F. Smith, Large Turbine Drafting Dept., Westinghouse Steam Div., Lester, Pa.

The following curve will aid in designing helical springs in a continuous range of size and under a variety of known conditions.

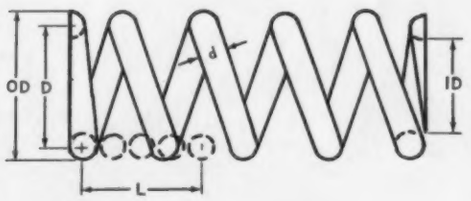
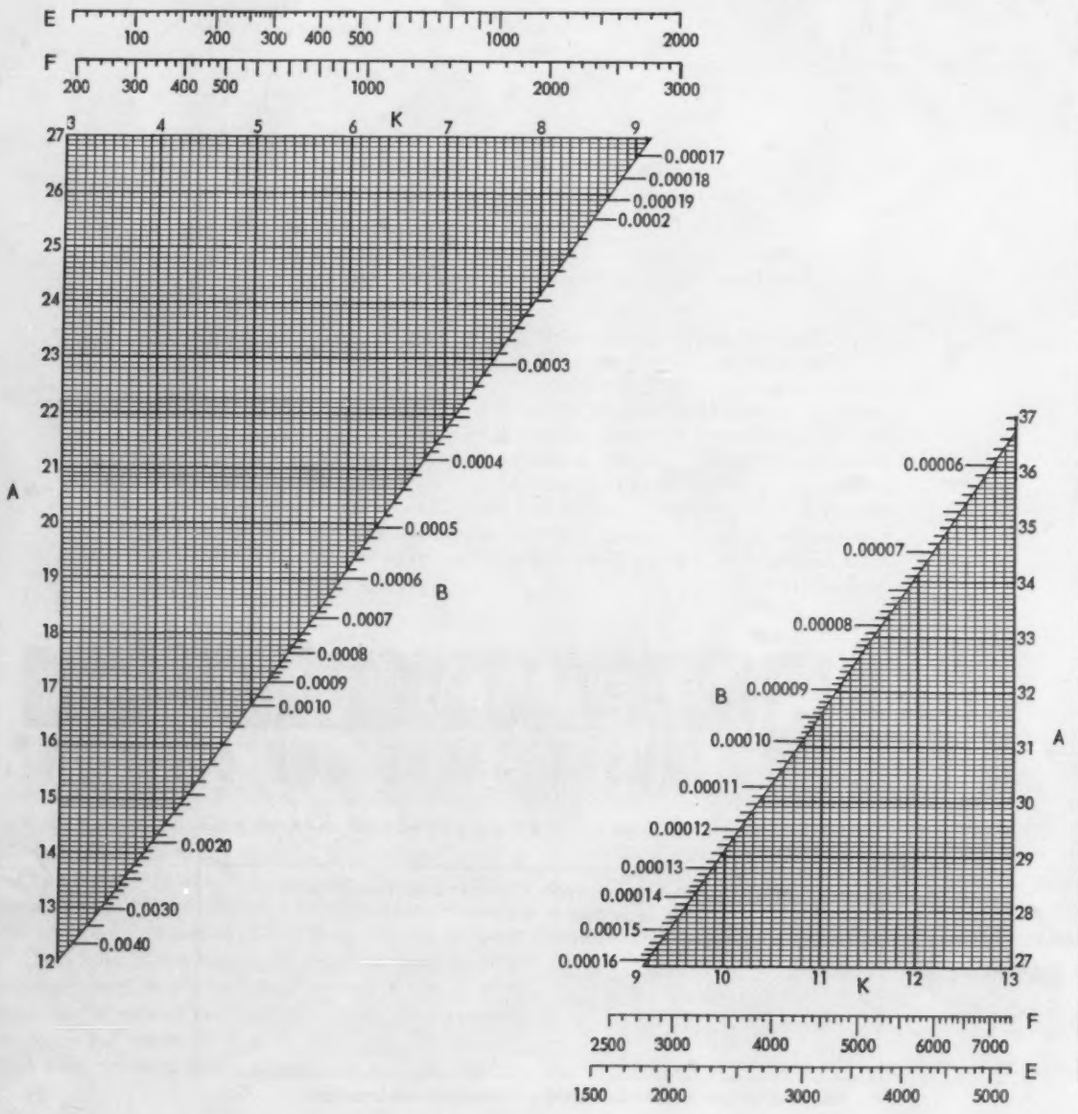
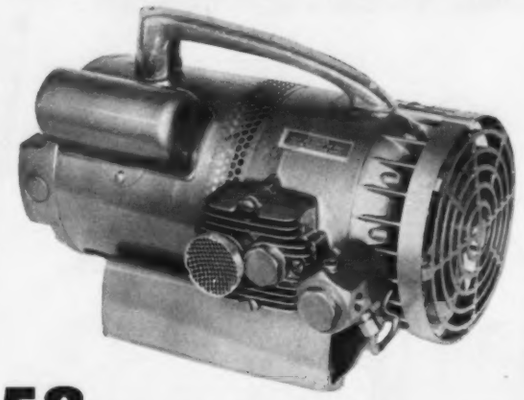


Table I will assist in applying the curve. Each column indicates steps to be followed under different known spring characteristics. The first column



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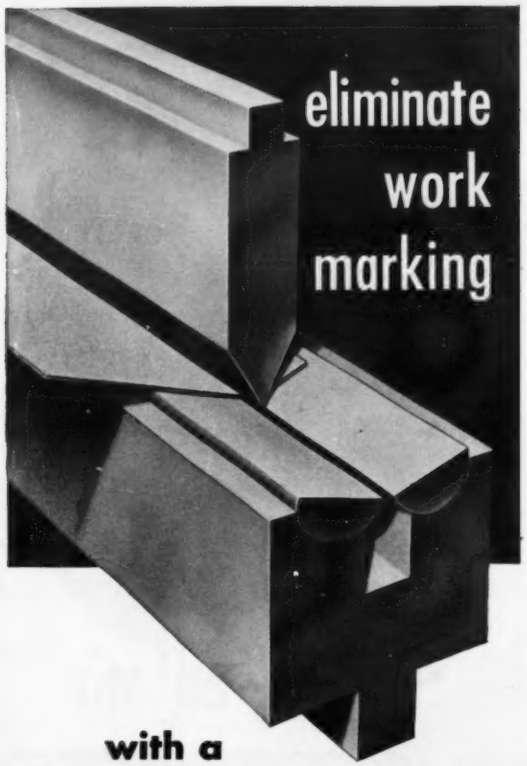
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	W	d	d	W	W	L	
						d	
	G	G	G	G	G	G	
	S	S	S	S	S	S	
CALCULATE		K					= D/d
			A				= Sd^2/W
						B	= $(w)(L)/Gd^2$
				E			= $S(ID)^2/W$
					F		= $S(OD)^2/W$
						N	= L/d
READ FROM CURVE	A	A		A	A	A	
	B	B	B	B	B		
			K	K	K	K	
CALCULATE		W				W	= Sd^2/A
	d			d	d		= $\sqrt{WA/S}$
	D		D	D	D	D	= Kd
	(w)(N)	(w)(N)	(w)(N)	(w)(N)	(w)(N)		= GBd
	(w)(L)	(w)(L)	(w)(L)	(w)(L)	(w)(L)		= GBd^2

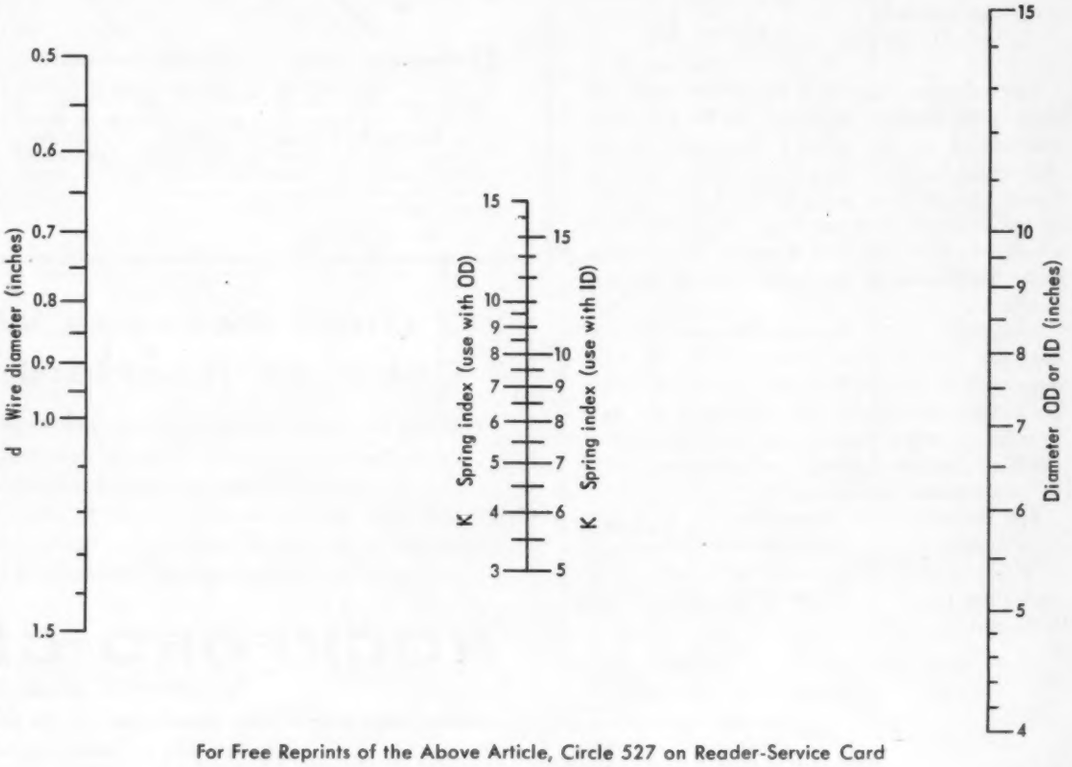
illustrates the simplest spring design wherein the only requirement is a spring that will support a known load W. The first step is to select any value of K and follow operations given.

Nomenclature:

- D = mean diameter of spring, inches
- d = wire diameter, inches
- OD = outside diameter (D + d), inches
- ID = inside diameter (D − d), inches
- W = load, lb
- w = load per inch deflection, lb/inch
- N = number of active coils
- G = modulus of rigidity, psi
- S = stress, psi
- L = closed coil length, inches (measured only over the active coils)
- K = spring index
- a = stress correction factor

Note the use, for convenience, of the terms (w)(L) and (w)(N), which may be separated into factors representing w, L and N. The (w)(L) terms for several springs whose L's are alike can be added to obtain the combined (w)(L) for several springs, such as when they are assembled in concentric fashion to operate in parallel. The curve may be used to advantage when requirements involve multiple springs operating together either in parallel or in series.

The nomogram permits determination of ID or OD, d and K if two are known, which will be useful when considering radial clearances.



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Deflection of Stepped Shafts

J. P. Hatch, Assoc. Professor, Mechanical Engineering, University of Rhode Island, Kingston, R. I.

Deflections of a shaft which has more than one diameter are difficult to calculate and usually are determined graphically. Changes in moment of inertia occasioned by changes in shaft diameter usually are accounted for by constructing an M/EI diagram or at least by computing values for M/I and integrating these values to determine the deflections.

This article describes a graphical construction that accounts for changes in moment of inertia by using appropriate changes in pole distance for each shaft diameter. The adjusting of pole distances permits construction of a slope diagram and, upon integration, gives a deflection diagram.

The method is illustrated by the accompanying example. The shaft is divided at changes in diameter and at the load into sections A, B, C and D to facilitate description.

Using a space scale of $s_x = 8$ inch/inch (i.e., 1-1/2 inches = 1 ft) and a force scale $s_{y1} = 500$ lb/inch, a shear diagram is constructed. By selecting a pole distance of any convenient length (H = 3/4 inch), the scale of the moment diagram may be computed:

$$s_{y2} = (H)\,(s_x)\,(s_{y1}) = (3/4)\,(8)\,(500) = 3000 \text{ lb-in/inch}$$

The moment diagram is drawn by using the slope of the appropriate rays of the force polygon attached to the left end of the shear diagram (Reference 1). These rays are identified as Rays 1 and 2 in the force polygon and Lines 1 and 2 in the moment diagram. They are drawn from a common base line. The moment at any point along the beam may be scaled from the moment diagram.

Integration of the moment diagram will produce the slope diagram. The scale for the slope diagram is $S_{y3} = (H)\,(S_{y2})\,(S_x)/EI$ and the units are radians/inch. Since H/I appears in the scale formula, a single scale can be used throughout the slope diagram if changes in I are accompanied by proportional changes in H.

For the 1-inch-dia cross-section, $I_1 = 0.0491$ inch^4 and for the 1-1/4-inch-dia cross-section $I_{1\text{-}1/4} = 0.120$ inch^4. If H_1 is selected arbitrarily as 1/2 inch then $H_{1\text{-}1/4} = (0.120/0.0491)\,(H_1) = 1.22$ inch, and the scale

$$s_{y3} = \left[\frac{(1/2)\,(3000)\,(8)}{30\,(10)^6\,(0.0491)}\right] \text{or} \left[\frac{(1.22)\,(3000)\,(8)}{30\,(10)^6\,(0.120)}\right] = 0.00815 \text{ radian/inch.}$$

(Text continued on page 96)

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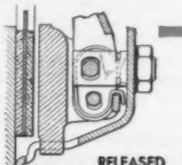
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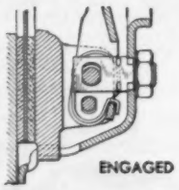
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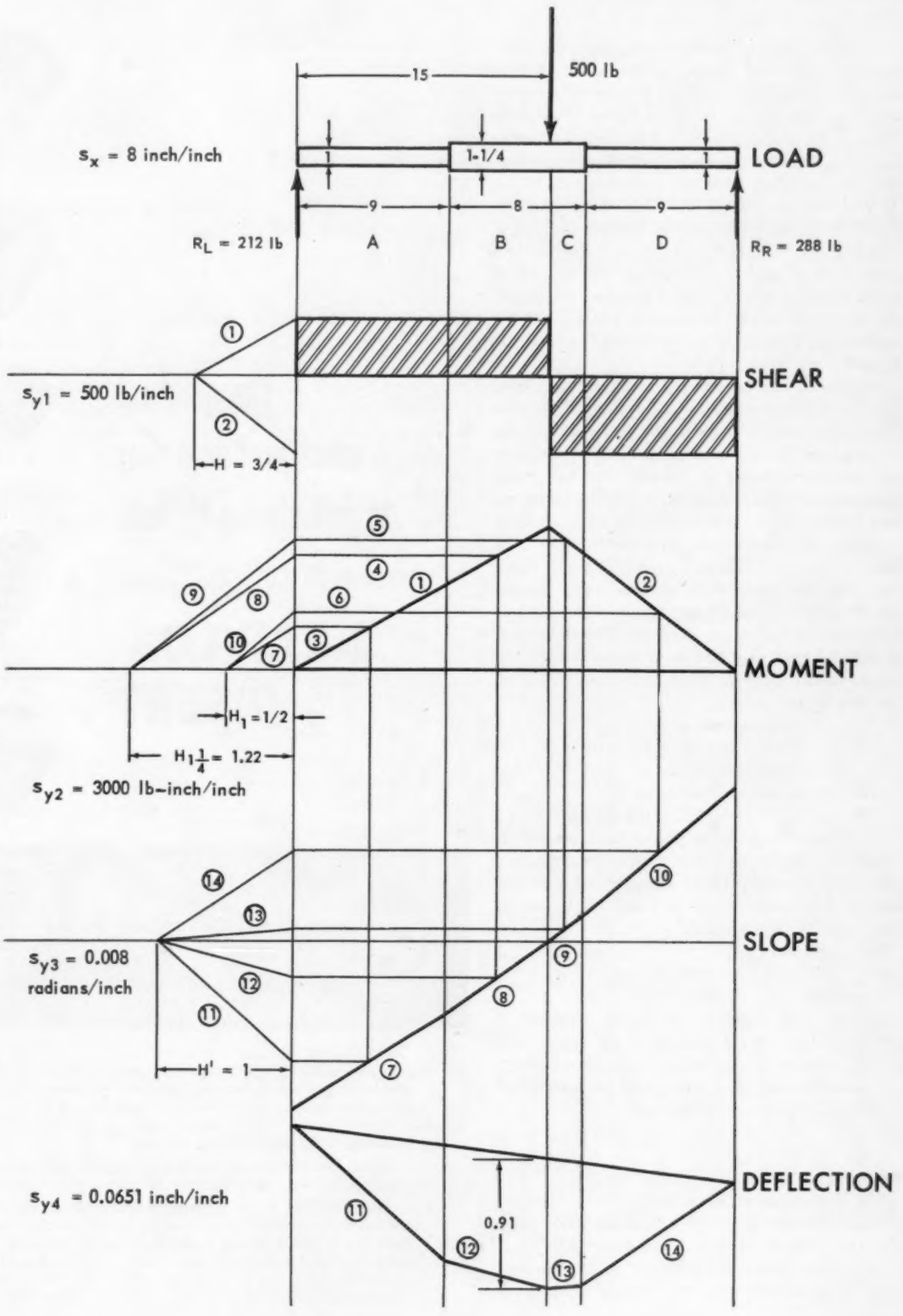
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Stepped Shafts . . . *Cont.*

To integrate the moment diagram, the midpoint of 1-inch-dia portion of the shaft, Section A, is found and Line 3 is run horizontally to the left from this point. Here, Ray 7 is drawn by using pole distance $H_1 = 1/2$ for the 1-inch dia. Line 4 is drawn next from the midpoint of Section B. Together with the pole distance $H_{1\text{-}1/4} = 1.22$, this established the slope of Ray 8. Rays 9 and 10 are drawn in similar fashion.

These Rays (7, 8, 9 and 10) are used in Sections A, B, C and D to construct the slope diagram. They give the correct relative values for the slopes; however, because no constant of integration is known, no point of zero slope can be located.

Any point can be selected and used as a base line for drawing rays and integrating. If the correct point could be chosen, the deflections could be measured from a horizontal baseline. Because the point is selected at random, the deflection diagram probably will not have a horizontal baseline.

Using the point under the 500-lb load as a base, Rays 11, 12, 13 and 14 are drawn and transferred to the appropriate sections. Now the extreme ends of lines 11 and 14 are connected to complete the deflection diagram. The deflection under the load may be found by measuring the height of the diagram (0.91 inch) and multiplying this by the scale s_{y4}.

The scale is computed as

$$s_{y4} = H' (s_{y3}) (s_x) = (1) (0.00815) (8) = 0.0651 \text{ inch/inch}$$

And the maximum deflection is

$$y = (0.91) (0.0651) = 0.0593 \text{ inch}$$

If deflections at many points were needed, it would be helpful to select a pole distance of a particular fractional value. As suggested in Reference 2, this would result in a scale S_{y4} equal to some readily usable value.

For example:

$$s_{y4} = (H') (s_{y3}) (s_x)$$

Choosing: $s_{y4} = 0.05$, then

$0.05 = (H') (0.00815) (8)$ and $H' = 0.767$

Using $H' = 0.767$ instead of $H' = 1$ inch would produce a deflection diagram on which measured vertical distances could be multiplied by 0.05 to obtain actual deflections.

References:

(1) This construction is described in *"Machine Design"; Joseph E. Shigley; McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y.*

(2) *"Mechanical Vibrations"; A. H. Church; John Wiley & Sons, Inc., 440 4th Ave., New York 16, N. Y.*

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TAP-LOK



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Bending Stress in a Leaf Spring

Richard Wadler, Mechanical Engineer, Raytheon Co., Bedford, Mass.

This nomogram is based on the elastic curve equation:

$$S_B = (E)\,(t)\,/D$$

Where:

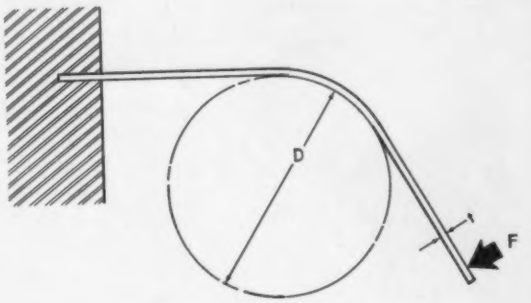
S_B = bending stress, psi
E = modulus of elasticity, psi
D = bending diameter of spring, inches
t = thickness of spring, inches

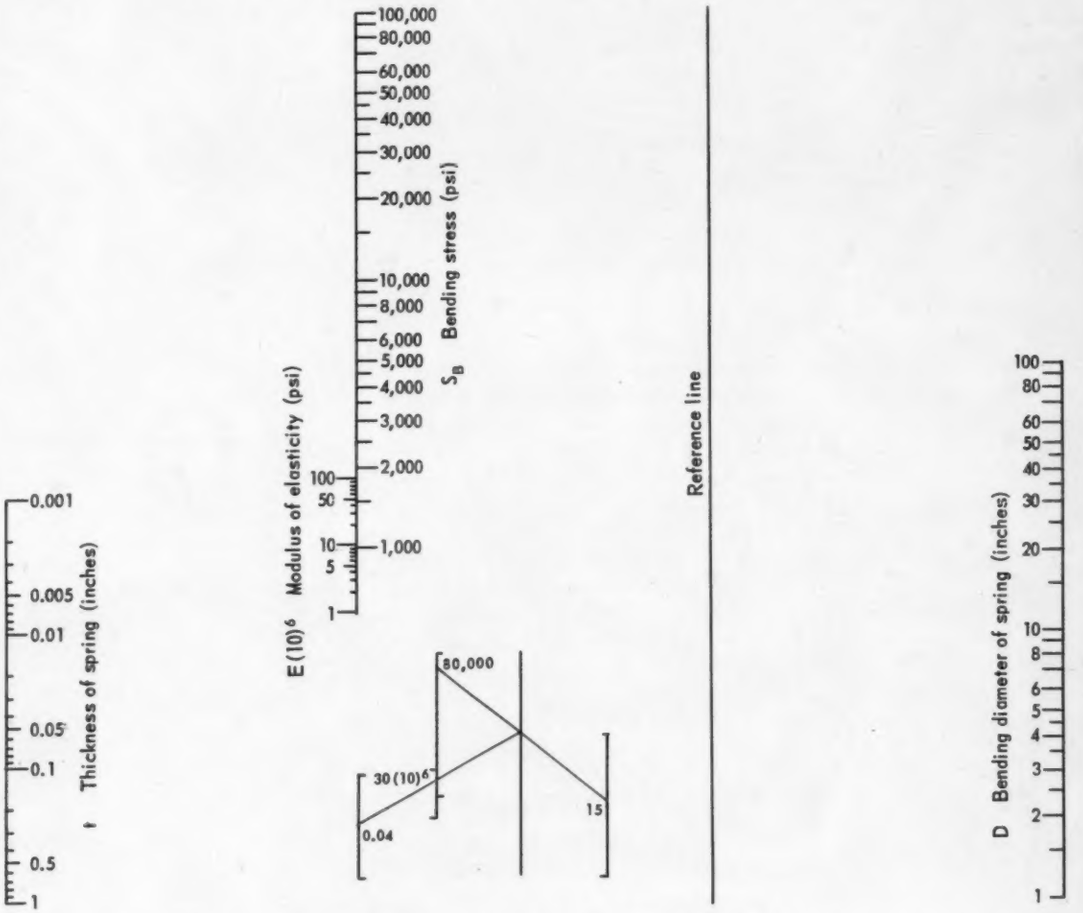
Example:

Determine the bending stress in a leaf spring 0.04 inch thick, which has a bending diameter of 15 inches. The modulus of elasticity of the material is 30 $(10)^6$ psi.

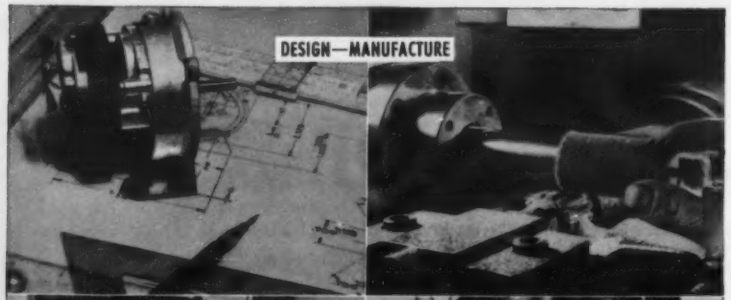
Solution:

Align t = 0.04 inch with E = 30 $(10)^6$ psi, intersecting the Reference line. Align this intersection with D = 15 inches and read S_B = 80,000 psi.





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HOW MERKLE-KORFF "PERFORMANCE BALANCE" PAYS OFF IN FHP GEARMOTOR DEPENDABILITY

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NEW LITERATURE

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High-Fidelity Audio Tubes 451

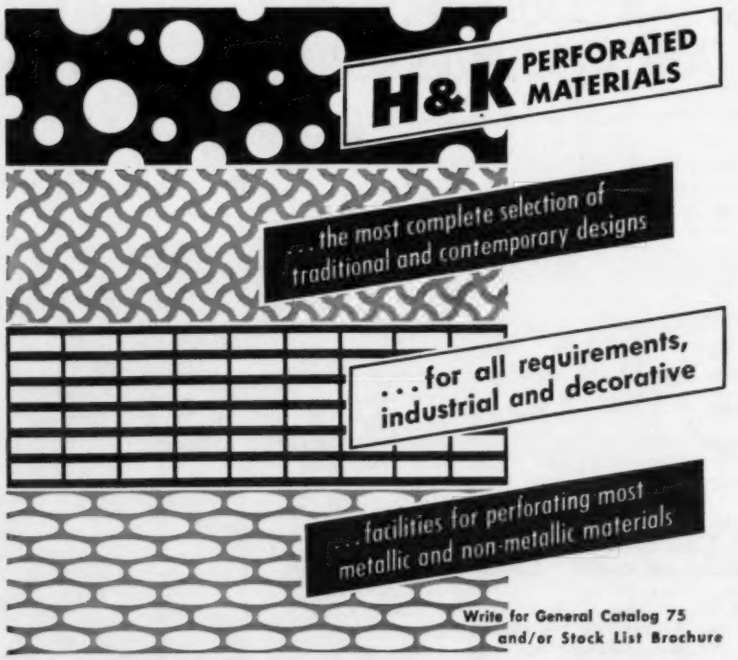
Specifications on a line of 26 amplifier, preamplifier and rectifier tubes. Extent and features of the audio tubes are featured and manufacturing processes described. Bulletin ETD-2622, 12 pages, outlines the company's technical information and product service, fast warehouse delivery, "Snow White" manufacturing, creative engineering, and application and field engineering. General Electric Co., Receiving Tube Dept., Owensboro, Ky.

The Fuel Cell 452

Technical Topics, Vol. 4, Sec. 7, July 1961, features an article, "The Fuel Cell", by Bob White. The fuel cell, fuel-cell concept and developments in fuel cells are detailed. Hydrogen-oxygen fuel cells, redox fuel cells, molten slat electrolyte cells and ion exchange membrane fuel cells are described schematically and in text. The article concludes that the fuel cell may make major contributions to our everyday life in the not-too-distant future. Yewell Associates, Inc., Middlesex Turnpike, Burlington, Mass.

Bearing Nomenclature 453

"Bearing Parts and Nomenclature of Standard and Precision Bearings" clearly defines and illustrates ball and roller bearing parts and terms. Form No. 343, 24 pages, covers ball installation, dimensions, loads, alignment, types and functions of self-aligning, non-self-aligning and thrust bearings. Bearing accessories described are shields, seals, snap rings, seats and housings. SKF Industries, Inc., Front St. & Erie Ave., Philadelphia 32, Pa.



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Tap Handbook 454

A tap users' guide, a trouble-shooting section, resharpening instructions, a table on thread constants, Acme threads and drill diameters, and a glossary of terms. Standard and special taps are illustrated and described in the 24-page handbook. Application information is provided on X-Press taps. Items available from stock are indicated, and how to rush order special taps is explained. Besly-Welles Corp., South Beloit, Ill.

Miniature Ball Bearings 455

How the manufacturer is going to continue to offer present services and at the same time provide the customer with quality bearings is outlined in a three-page memorandum. The memorandum explains the consolidation of bearing lines Class 7 and Class 3 and provides a statement of simplified price policy. Quality developments in bearings and price reduction of Class 5 bearings, along with accompanying disadvantages, are reviewed. Included are two price sheets for "Basic 7" bearings, giving specifications and price policies. Miniature Precision Bearings, Inc., Precision Park, Keene, N.H.

Diamond Grinding Wheels Standards 456

The "American Standard Specifications for Shapes and Sizes of Diamond Grinding Wheels, Hand Hones and Mounted Wheels, B74.3-1961" contains 37 pages of information on standard shapes and sizes of diamond grinding wheels. Each standard shape of diamond wheel is illustrated and accompanied by a table listing the major dimensions of each standard size in that shape category. A shape and size of a diamond grinding wheel has been included in this standard only after determining, on the basis of sound engineering practice, whether or not it was designed, dimensionally, to perform the job for which it was intended. A guide to aid the manufacturer, the consumer and the general public. Grinding Wheel Institute, 2130 Keith Bldg., Cleveland 15, Ohio.

Circle 111 for Reader Service



VICTOR "CLEAN" REGULATORS

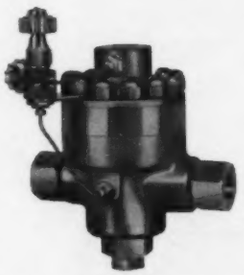
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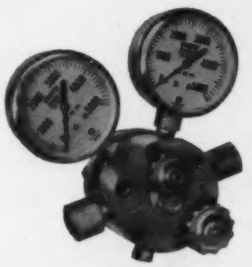
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Inlet to 6,000 psig.
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Panel mounting.



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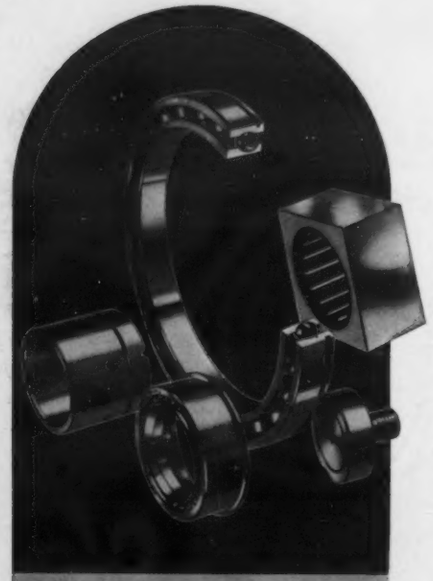
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Inlet to 10,000 psig.
Outlet to 10,000 psig.
Flows to 2,000 scfm.
Panel mounting if desired.

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73



McGILL® can solve your special purpose bearing problems

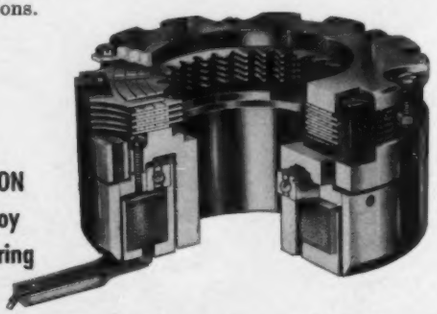
You may have found that a special bearing is the only way to add anti-friction advantages to non-standard shaft and housing dimensional combinations—perhaps a special type bearing incorporating odd shaped components or adjacent machine members will do the job best. Such special bearing design and production is part of everyday activity with McGILL. So don't design around a bearing barrier until you have consulted McGILL creative engineering. They will welcome an opportunity to make recommendations.



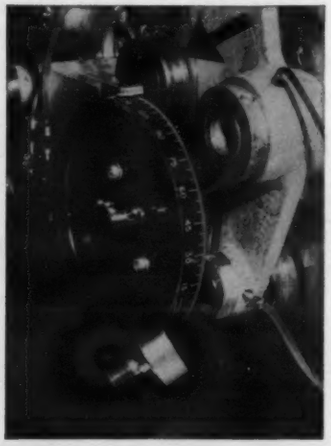
McGILL bearings in record-breaking MERCURY outboard motors

Hydroplane speeds averaging over 107 miles per hour, runabout endurance runs of 50,000 miles in 68 days and outstanding power exhibitions by Mercury outboard motors are a true test of component performance. McGILL split center main bearing sleeves are used in 60-80 horsepower six cylinder Mercury outboard motors and have played an important part in the high standards of performance set by these motors.

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LITERATURE

Air-Control Products **457**

For automating in-plant operations and for component use in new products. The 48-page digest-sized catalog describes air and hydraulic equipment ranging from cylinders, valves and rotating joints to filters, regulators, quick-acting couplers and hose fittings. Dimensions, flow rates and operating pressures, and typical air-control circuits are included in Catalog No. 125. A. Schrader's Son, Div. of Scovill Mfg. Co., Inc., 470 Vanderbilt Ave., Brooklyn 38, N.Y.

Motor Parts **458**

Features and advantages of improved Type BA series-motor parts rated 65 to 560w, 12,000 to 15,000 rpm. Illustrated Bulletin GEA-5665A, eight pages, discusses how new, one-coil-per-slot design, improved field and armature insulation and welding of commutator lead connections contribute toward increased performance and efficiency for built-in applications. Charts of ratings, frame sizes and dimensions are provided. General Electric Co., Schenectady 5, N.Y.

Electronic Components **459**

Features electronic tubes, semiconductors, transformers, chokes, meters, wire and test equipment. This "Green Sheet" catalog, 32 pages, contains many hard-to-find items of interest to purchasing agents, engineers, technicians and manufacturers. Price lists are included for a complete line of receiving tubes, electron tubes and semiconductors, transmitting tubes and special-purpose tubes. Barry Electronics Corp., 512 Broadway, New York 12, N.Y.

Filing System **460**

This "12 Ways to Cut Filing Costs" brochure emphasizes time-saving features of the "Spacefinder" filing system, including unique cabinet shelf-type files and "Unit Spacefinders" where documents are packaged in portable boxes. Cost-saving advantages include: complete visibility, good accessibility, time saving, saving in cost of return-filing, space savings, and ease of changing, expanding or reorganizing files. Tab Products Co., 995 Market St., San Francisco, Calif.

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MICRO SWITCH Precision Switches



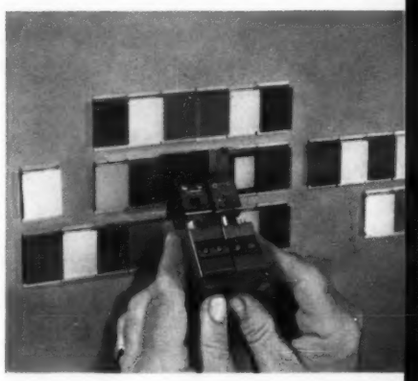


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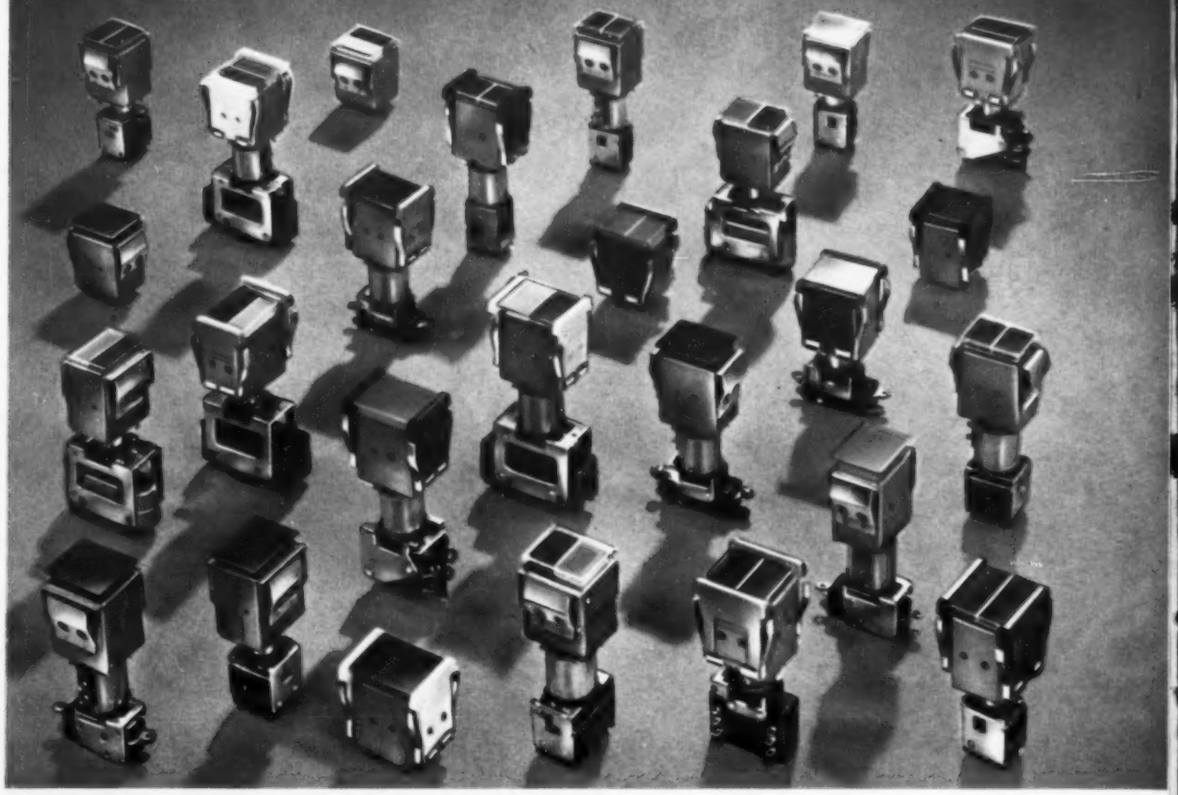
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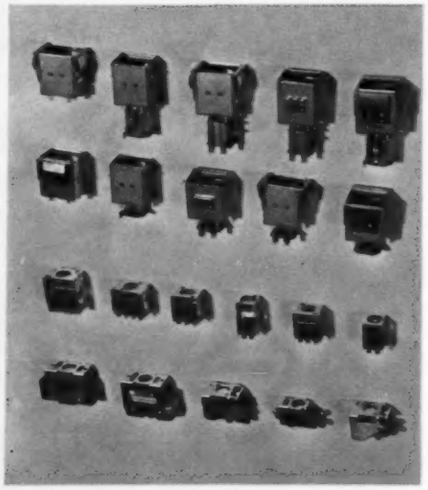
MICRO SWITCH . . . FREEPORT, ILLINOIS
A division of Honeywell
In Canada: Honeywell Controls, Limited, Toronto 17, Ontario

Honeywell
MICRO SWITCH Precision Switches

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Epoxy Protective Compounds 461

Bulletins MR-1 and MR-2 describe two new flexible room-temperature-cured epoxy compounds to protect motor stator windings against moisture, dirt, abrasion, impact, chemicals and other contaminants. Both products handle the shock typical in motor operations. Motor Casting Compound 10-063 is a two-component, flexible room-temperature-cured epoxy casting compound. Motor Butter 10-062 is a two-component, flexible room-temperature-cured epoxy butter. The materials come preweighed, de-aired and ready to use. Hysol Corp., Olean, N.Y.

Beryllium Bolts 462

A review of the development of the first beryllium structural bolting provides more than just a rundown of the high strength-to-weight ratio beryllium shear bolts recently introduced by the manufacturer. The basic treatise, entitled "1,910 Years of Beryllium", starts with the year 50 AD and continues through the research and development program leading to the fabrication of the first beryllium bolts. A technical section reviews outstanding physical characteristics of beryllium metal. Standard Pressed Steel Co., Jenkintown, Pa.

Infrared Cell Cooling 463

Specifications, design features and performance data for various types of equipment used in direct and remote cooling of infrared detector cells. Included are systems which are capable of cooling the infrared cell to liquid nitrogen (77K), liquid neon (27K) or liquid helium (4K) temperatures, as well as systems especially designed for use where severe space limitations in the region of the infrared detector cell exist. Form F-1268, 20 pages, includes a description of the company's designing and fabricating abilities. Linde Co., Div. of Union Carbide Corp., 270 Park Ave., New York 17, N.Y.

Polycarbonate Films 464

Physical and electrical properties of "Lexan" polycarbonate films are detailed in a 13-page technical report, No. CDC-396. Extruded and solvent cast films are compared, and suggested applications listed. Charts show loss of tensile strength with temperature; typical stress-strain curves for 4 mil cast film and 4 mil extruded film; tensile modulus versus temperature; light transmission; variation of dielectric constant with temperature (at 60 cycles), and variation of power factor with temperature (at 60 cycles). General Electric Co., One Plastics Ave., Pittsfield, Mass.

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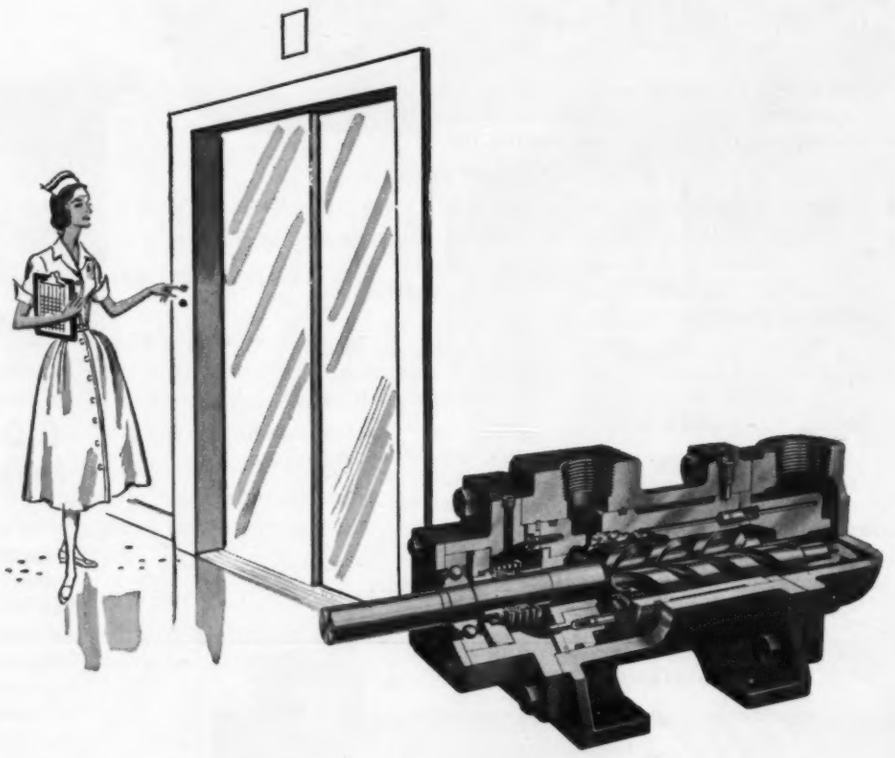
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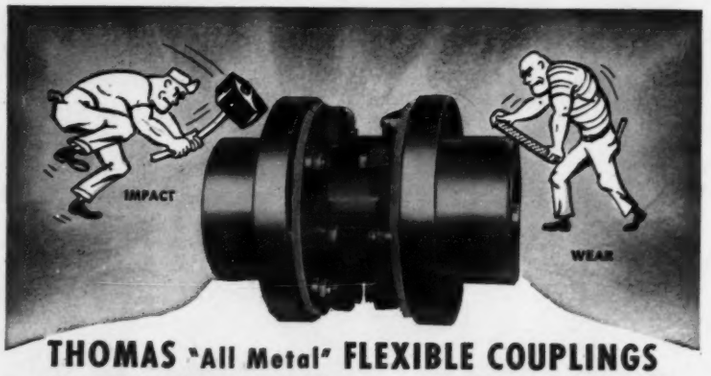
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LITERATURE

Literature available, at price listed, by writing Publications and Public Information Div., Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D.C., enclosing remittance.

FOUR-PART ENGINEERING DESIGN SERVOMECHANISM GUIDE— A complete course of instruction in the theory, components and system design of servomechanisms. Prepared as a handbook for designers of automatic control systems, each of the report's four sections covers a specific area of servomechanism engineering design. Section one contains a summary of present feedback-control theory as related to servomechanisms. Section two describes servomechanism components used as sensing elements and signal converters. Potentiometers, rotary transformers, tachometer generators, gyroscopes and analog-to-digital converters are covered. Section three includes electronic, transistor, magnetic, rotary electric, relay, hydraulic, pneumatic and mechanical amplifiers used in servo controllers. Section four deals with servo power elements and system design. Significant features of servo output members are discussed and a procedural guide for designing a servo system is provided. Published May 1961 (Duke University), the four sections are:

Section	*Subject*	*Order No.*	*Price*
1 (231 pages)	*Servomechanisms, Theory*	*PB 171 480*	*$3.50*
2 (128 pages)	*Measurement and Signal Converters*	*PB 171 481*	*2.75*
3 (222 pages)	*Amplification*	*PB 171 482*	*3.50*
4 (193 pages)	*Power Elements and System Design*	*PB 171 483*	*3.00*



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ADVANCES IN PHYSICAL SCIENCES. A discussion of the origin of cosmic rays, a report on semiconductor bolometers and a Soviet scientist's interpretation of quantum mechanics are included in a collection of articles translated from "Advances in Physical Sciences", a journal of the USSR Academy of Sciences. Other articles in the volume include data on the Lorentz transformations, theory of the Vavilov-Cherenkov effect, a survey of metrology, magnetohydrodynamics, cathode-ray tubes and resonance scattering of γ-rays on nuclei. The journal's History of Physics section discusses the state-of-the-art of Italian physics. Publication AEC-tr-3972; 674 pages; $7.

A LUNAR POWER PLANT could be assembled on earth, transported by rocket and operated on the moon. Capable of full-power continuous operation for two years with automatic control, the plant would be used to furnish energy for lunar spacecraft refueling stations, television relays, and stellar and physical observatories. The plant's working fluid is mercury and its principle components consist of a fast reactor in a direct cycle with a mercury-vapor turbine. The high-frequency generator, hydrogen compressor for the generator cooling system, mercury-recirculating pump and condensate pump are on an extension of the turbine shaft. The mercury vapor is condensed and the hydrogen cooled in wing radiators. Protection for the machinery is provided by a sealed cylindrical shell. For transport to the moon, the four radiators can be folded about this shell. Upon arrival, the power plant section can be disconnected from the rocket and anchored in a crater of the moon. The radiators would then be unfolded to form four wings at 90-deg to each other. Each radiator is a vertical tube-and-fin type built in concentric cylindrical sections of increasing diameter. The curved headers are connected. Published December 1960; by R. H. Armstron et al, Argonne National Laboratories; Report No. ANL-6261; 137 pages; $2.50.



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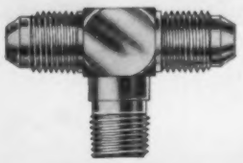
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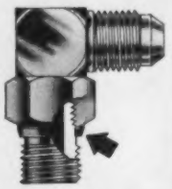
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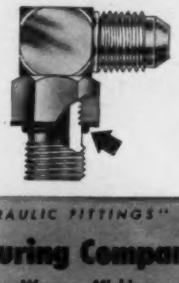
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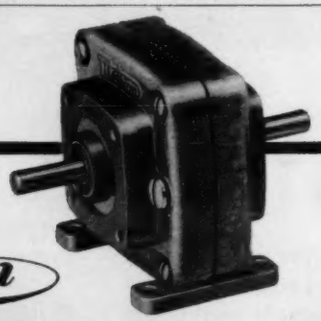
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CHEMICAL MILLING innovations have ushered in an industrial field considered so new in concept and broad in scope that a designer's ingenuity should be his only limitation in exploiting this methodology. Techniques have been perfected to apply chemical milling accurately and precisely enough to produce complex shapes, nonsymmetrical patterns, intricately stiffened structures and tapered skin. Some of the materials successfully milled are aluminum alloys, steel, stainless steel, titanium, magnesium and mag-thorium. The cost of removing aluminum alloy by means of chemical milling averages about one-fourth that of comparable machine tool operation. Published December 1960; by C. H. Rose, Watervliet Arsenal; Catalog PB 171 112; 21 pages; $0.75.

MANUAL OF SEMICONDUCTOR TRIODES AND DIODES—an English translation of a 450-page Russian electronics handbook contains both general and detailed data on transistors and semiconductor diodes. The manual is divided into five sections. The first section includes general information on transistors and semiconductor diodes. The second section is devoted to low-power, low-frequency transistors. The third section contains data on "germanium-alloy-type p-n-p low-frequency" transistors. Sections four and five include general data on high-power transistors and semiconductor diodes. Figures, graphs and tables of electrical parameters are provided for each of the sections. Published 1961; Catalog No. 61-31116; 450 pages; $6.



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.5000	.7500	.1562	SR8347	.010	.587	.672	16	1/16	95
.6250	.8750	.1562	SR10287	.010	.712	.797	18	1/16	98
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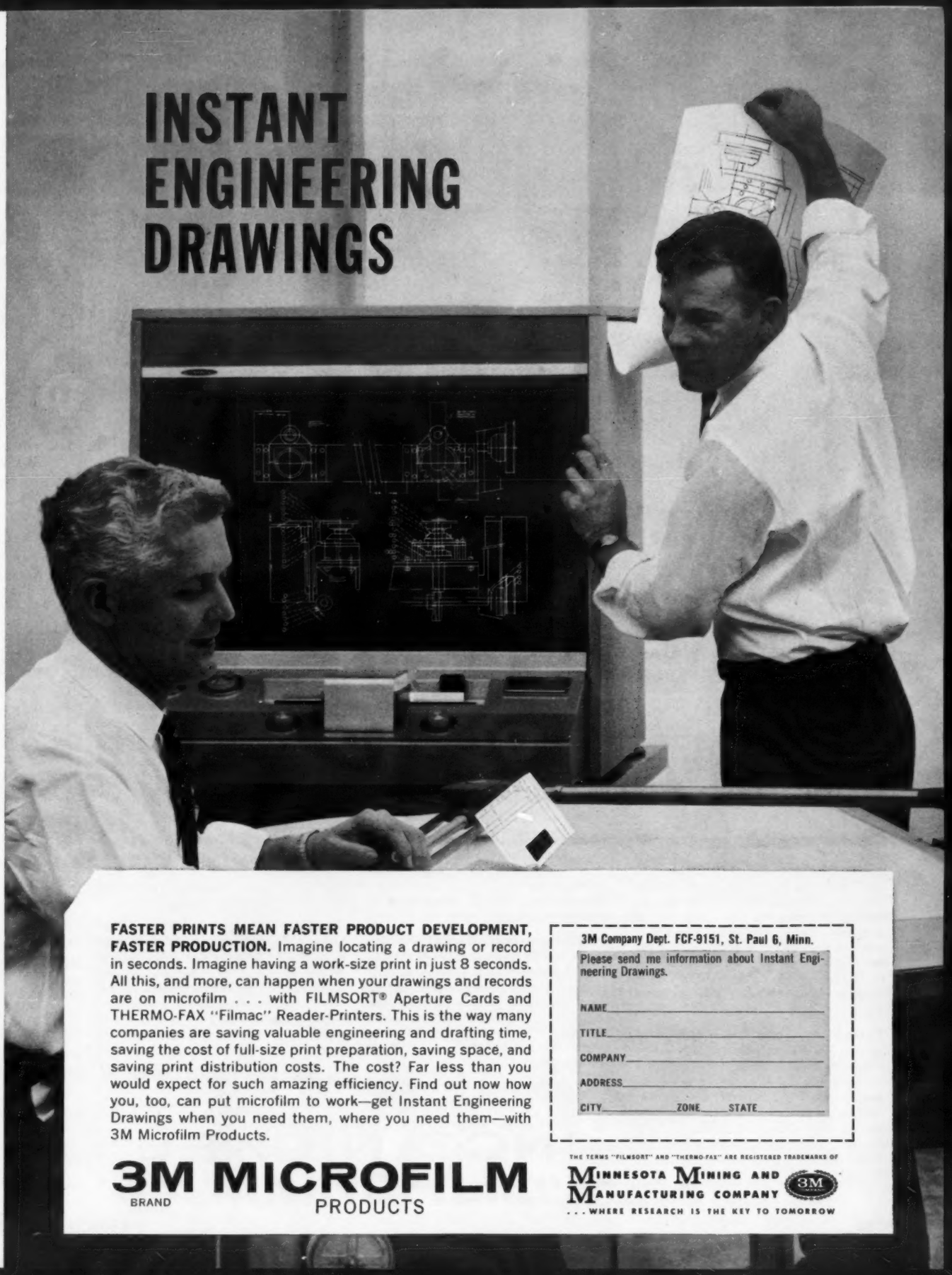
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DIRECTORY OF NATIONAL ASSOCIATIONS OF BUSINESSMEN contains information on over 2000 national associations. This latest edition supplies new information on 200 associations which have changed their addresses or chief executives. In addition to trade associations, the 1961 Directory includes over 100 societies of engineers and scientists. Number of members, size of staff, name and title of chief executive, year organized and mailing address are given for each organization. $0.50.

A NEW ELECTROCHEMICAL SYSTEM FOR HIGH-VOLTAGE LOW-CURRENT DRAIN APPLICATIONS. Use of a miniature 6v battery with cells only 0.013-inch thick and 1/3-inch wide over an operating range of −65 to +165F is described. The battery was developed as an energy source to charge capacitors and for other low-drain applications. Its capacity is five coulombs and its drain rate is 0.1 to 10 microamps. Further fabrications and tests were recommended in order to reveal manufacturing and application problems not considered during research. Published 1961; by W. J. Pauli, Diamond Ordnance Fuze Laboratories; Catalog PB 171 582; 19 pages; $0.75.

COMMERCIAL STANDARDS, SIMPLIFIED PRACTICE RECOMMENDATIONS, and COMMODITY STANDARDS. New lists of commercial standards revised to June 1, 1961 and simplified practice recommendations revised to July 1, 1961. The new indices list commercial standards for 22 classifications of manufactured products and simplified practice recommendations for 19 classifications. Commodity standard is a term applied to both of the above series of standards. A pamphlet entitled "Commodity Standards, What They Are—How They Are Done—Why They Are Used" is also available. Single copies of the lists and the pamphlet are available without charge upon request to the Commodity Standards Div., U. S. Dept. of Commerce. Ask for Catalog No. 978, List of Commercial Standards; Catalog No. 979, List of Simplified Practice Recommendations, and Commodity Standards Pamphlet.

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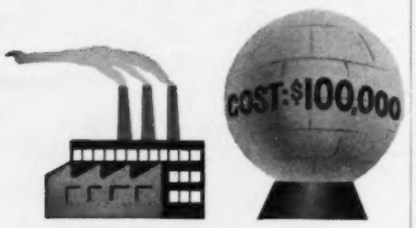
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Self-Contained Lubrication System

A. F. M. Ashworth, Mechanical Engineer,
Associated Electrical Industries, Ltd., London, England

In a conventional constant-level oil-bath lubrication system, the oil in the bearing must be controlled closely if churning and consequent heating and oil oxidation are to be minimized. The work discussed in this article describes a bearing arrangement in which a greater variation in oil level could be permitted within the bearing housing, while at the same time achieving other advantages, such as a lower bearing oil temperature and less oil aeration.

The method under consideration is a self-contained oil-lubricated bearing arrangement. This can be defined as being applicable to light bearings with DN values between 250,000 and 400,000. The DN value is the product of the shaft diameter in millimeters and the rotational speed in rpm.

A number of bearing arrangements was considered and tested in the rig shown in Fig. 1. The rig consists of a short shaft supported in a single test bearing enclosed in a steel housing fitted with "Perspex" caps. The shaft is driven by a variable-speed d-c motor through a flexible coupling which provides the shaft-end location. Three types of bearings were used in the rig; they were all 3-1/2-inch-dia, light-series bearings with cages located on the rolling elements (Fig. 2).

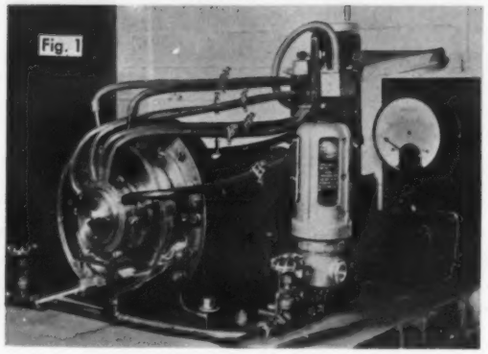
An external make-up lubricator was coupled to the base of the rig to maintain a constant oil level in the housing when required. It consists of an inverted oil bottle fitted with a funnel-shaped neck which just dips into the oil in the lubricator base.

Constant-Level Oil-Bath Lubrication

A conventional constant-level oil-bath lubrication system was tested in the rig using the arrangement shown in Fig. 2. Increasing the immersion of the rolling elements from, for example, 1/16 to 1/8 inch caused greater oil turbulence and frothing, as well as marked increase in oil mist in the enclosure.

Driving Torque

Experiments were conducted to determine the torque necessary to drive a bearing with differing amounts of lubrication over a wide range of speeds. Fig. 3 shows torque required to drive one of the test bearings at 1000 rpm. The test commenced with the bearing dry. Oil was added in small quantities while torque measurements were made. The test continued until the input torque was constant and any further oil added was thrown out of the bearing.



The torque required to drive the bearing in the ideal condition was termed the "Ideal Driving Torque". For satisfactory lubrication, the ratio of driving torque to ideal driving torque is 1.2:1.5, depending on the type of bearing and lubrication.

The variation in ideal driving torque with speed for the three test bearings is shown in Fig. 4. The difference among the values for different bearings results from their different constructions.

Disc Lubrication

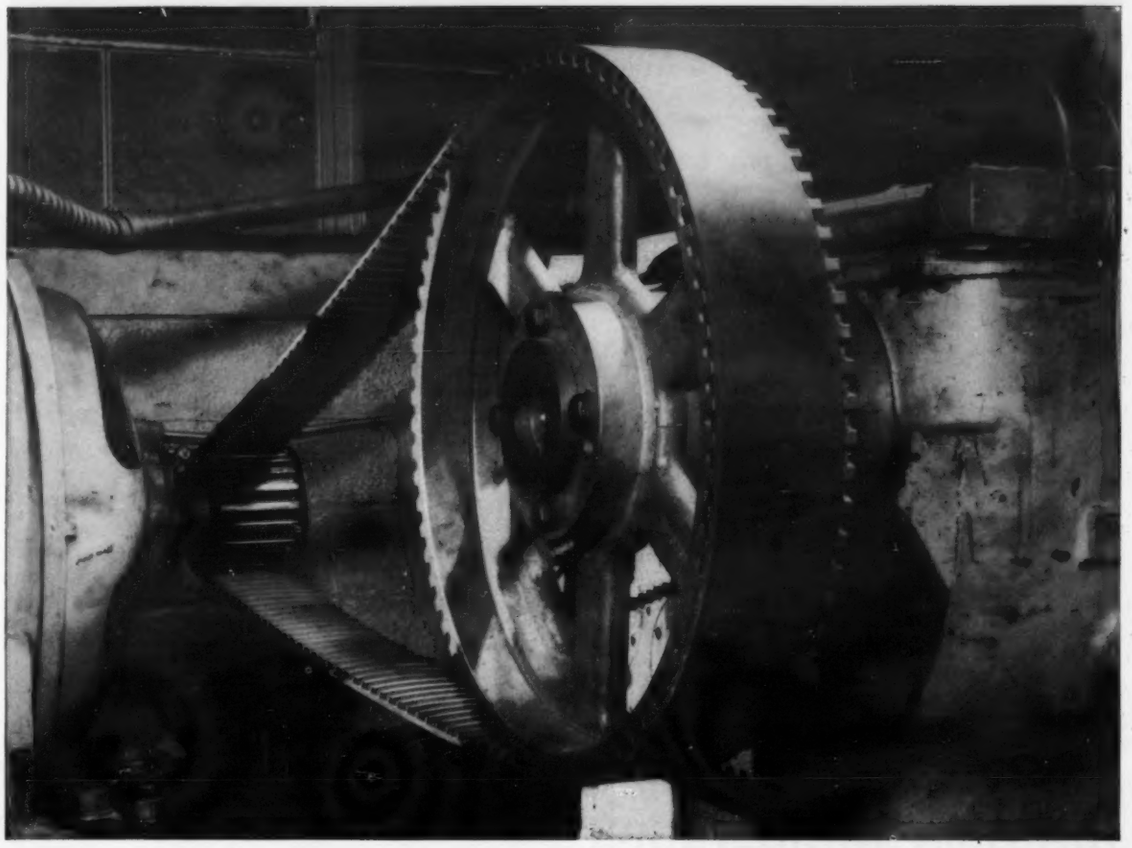
In this system, the bearing is separated from the oil reservoir by a partition and the shaft carries a disc which rotates in the oil in the bearing compartment. This compartment contains two baffles to restrict oil flow, one for each direction of shaft rotation.

When the shaft is stationary, oil levels in the bearing compartment and the reservoir are the same, since they are in communication through a restriction orifice in the partition. On starting, the disc picks up oil from the bearing compartment and throws it on the walls of the bearing cap and against an oil-collecting rib at the top of the enclosure. The cap is arranged so that the oil flung on the cap's sides drains into the reservoir, while that which strikes the top rib runs into the bearing. This action quickly lowers the level of oil in contact with the disc and raises the reservoir level. Simultaneously, oil flows from the reservoir through the orifice into the bearing compartment. Under these conditions a state of equilibrium soon is reached. Many experiments were conducted to determine the optimum disc size and profile, orifice and oil baffle dimensions and the effects of variation in stationary oil level in the enclosure. Before discussing the results, the second system is described so that comparisons can be made at the same time.

Controlled Self-Circulating Oil Lubrication

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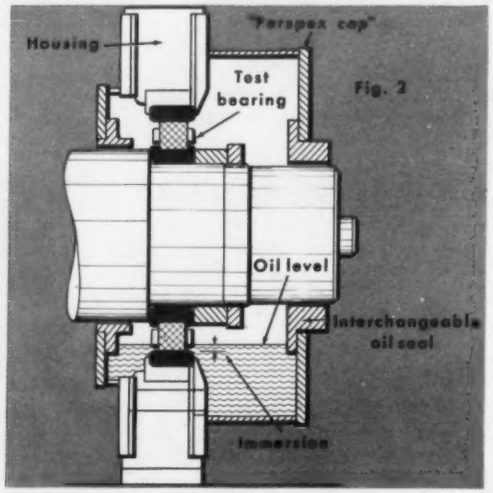
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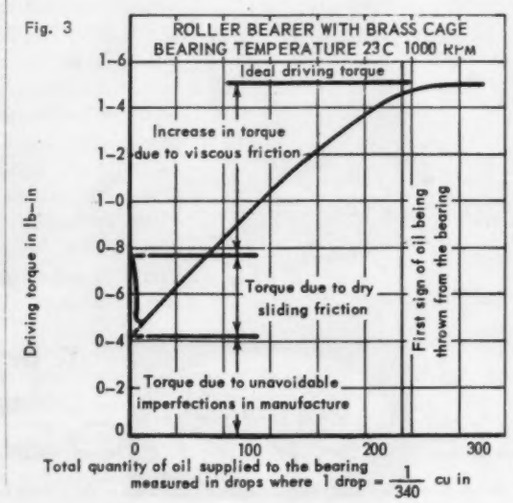
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the rotating elements. The schematic arrangement is illustrated in Fig. 6. The bearing is separated from the main reservoir by a partition which is bypassed by a metering orifice. In operation, some of the oil flung from the rotating bearing is prevented by the partition from re-entering the bearing. This causes a difference between the oil levels in the bearing compartment and the reservoir, which permits a predetermined oil flow rate into the bearing compartment. This rate of flow exactly equals the rate of discharge of oil over the partition.

This system has merit over the oil-bath system in that fairly large variations in the stationary oil level are possible for very small changes in the running oil level in the bearing compartment. That is, much larger variations in the positional setting of the external constant-level oil lubricator can be tolerated.

Fig. 3





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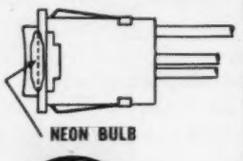
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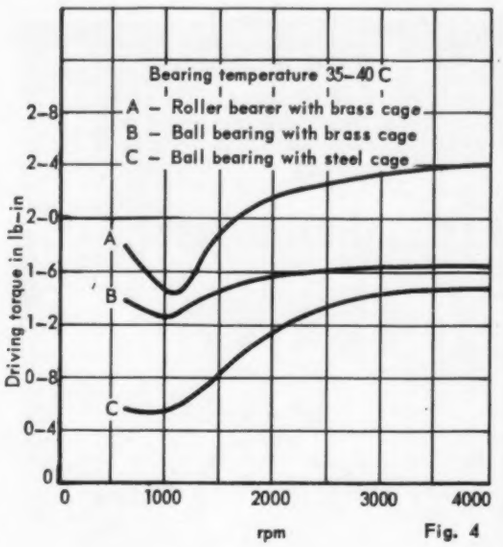


Fig. 4

Test Results

Fig. 7 shows torque variation required to drive the roller bearing at 3000 rpm plotted against the maximum stationary depth of immersion of the rollers for each lubrication method. The full portions of the curves represent the satisfactory range of operation. The lower limit was determined by the minimum lubrication requirement, the upper by the degree of oil churning.

This test shows that the disc and self-circulating systems allow greater permissible variations in the stationary oil level than could be tolerated with a plain oil bath. On the basis of optimum depth of stationary immersion, profile of disc and baffles, dimensions of cap, partition and restriction orifice

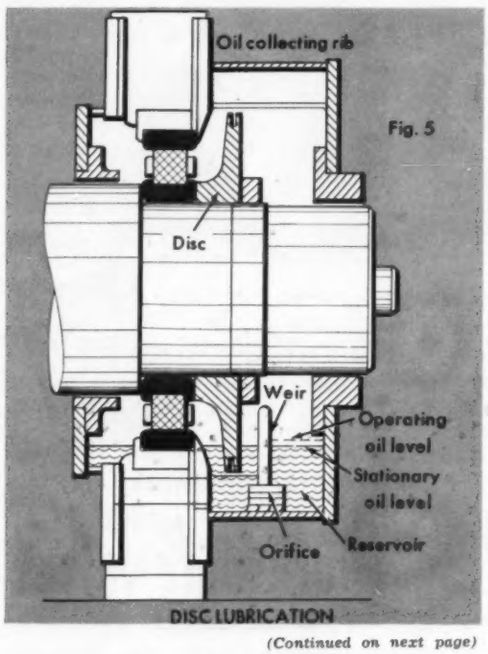
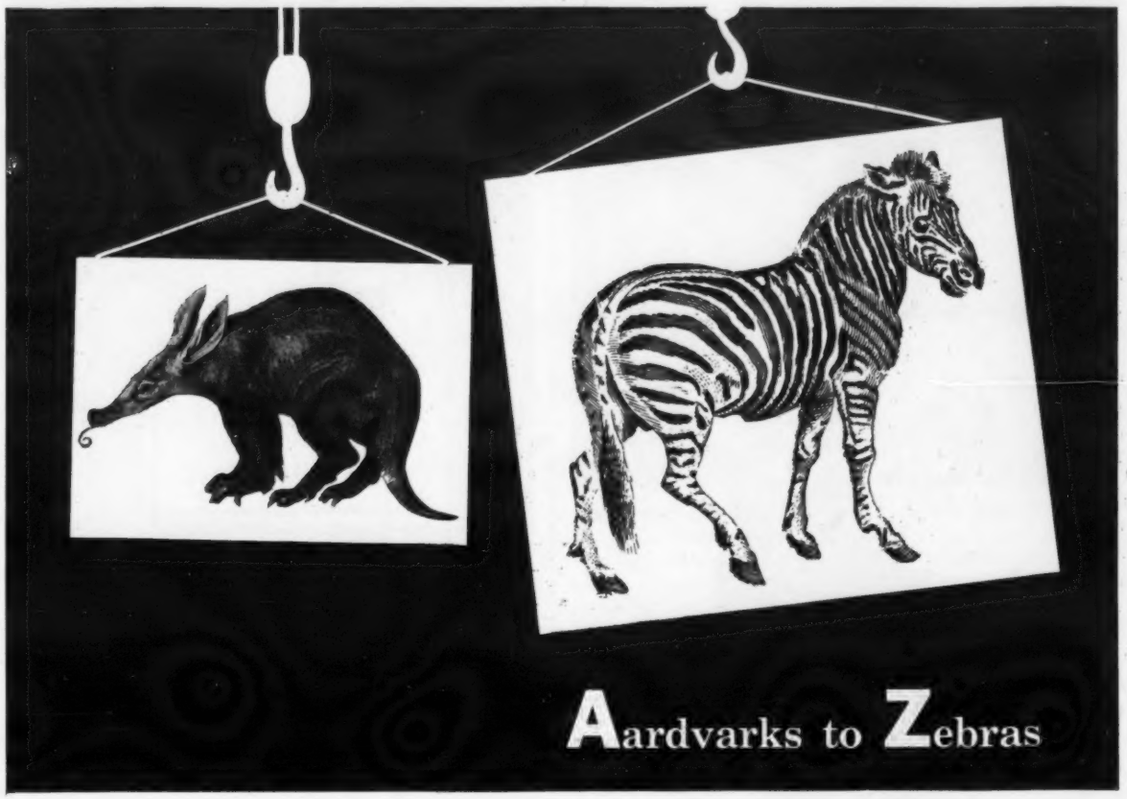
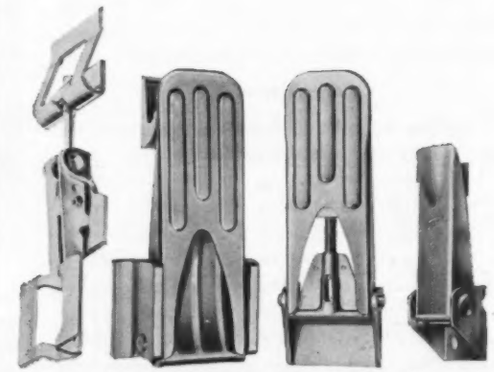


Fig. 5

(Continued on next page)





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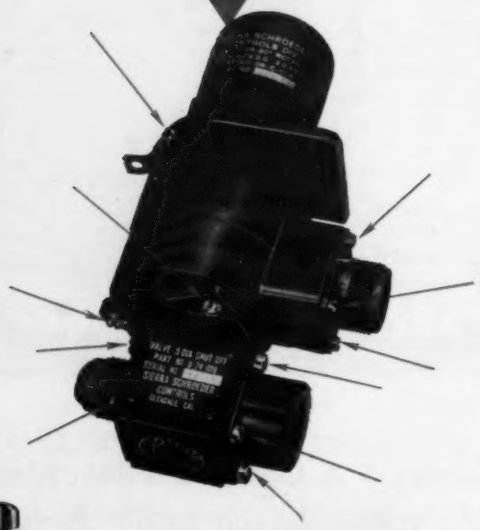
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Use of Long-Lok Self-Locking Screws on this Sierra-Schroeder Controls Model 74-01B Valve eliminated lock wire, provided repeated re-use—simplified field service. Long-Lok Self-Locking Screws are used on the housing of this valve as well as on the gear train mounting where an extremely restricted assembly area makes the use of lock wire a time consuming and prohibitively expensive operation.

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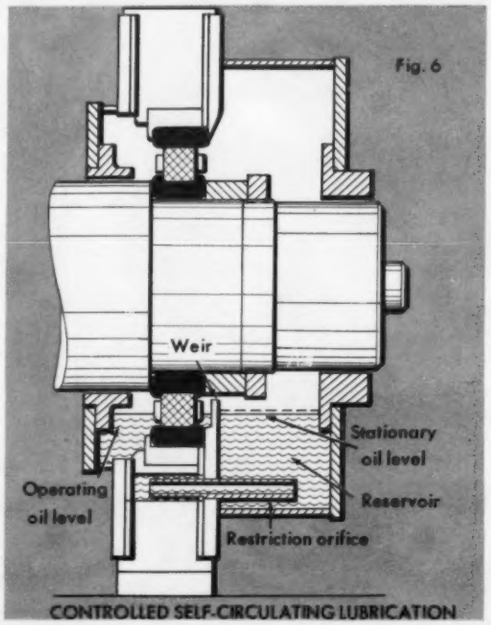
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CONTROLLED SELF-CIRCULATING LUBRICATION

for each of the systems, Fig. 8 shows the variation in driving torque with speed for the same roller bearing. This also shows the ideal driving torque for bearing and illustrates improvement obtained over the conventional oil bath system.

During these tests, the bearing always was allowed to reach its steady-state running temperature before recordings were made. The bearing temperature was measured by a mercury-in-glass bulb thermometer in contact with the outer race.

Conclusions

The test curves indicate that the new systems are superior to the conventional oil-bath method since they both allow a greater permissible variation in the external lubricator setting, 1 inch in the case of the disc and 3/8 inch for the self-circulating system. They both result in lower operating temperatures and provide a greater circulation of oil than occurs in an oil-bath system.

Of the two new systems, the controlled self-circulating system is preferred. It has the advantage that it utilizes most of the oil picked up by the rotating elements, whereas only a fraction of the oil picked up by the disc is delivered to the bearing. The disadvantage of the disc system is the comparatively larger amount of oil aeration caused by the disc, though it is still an acceptable system.

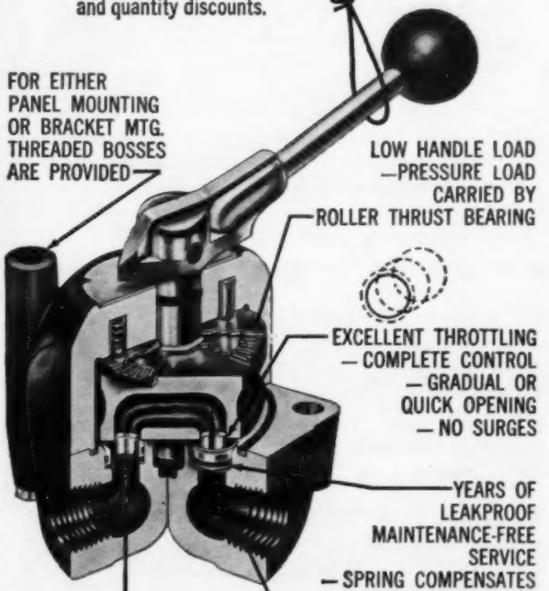
Patent applications have been filed for the new systems of self-contained oil lubrication. The trademark "Circon" has been registered for the controlled self-circulating system.

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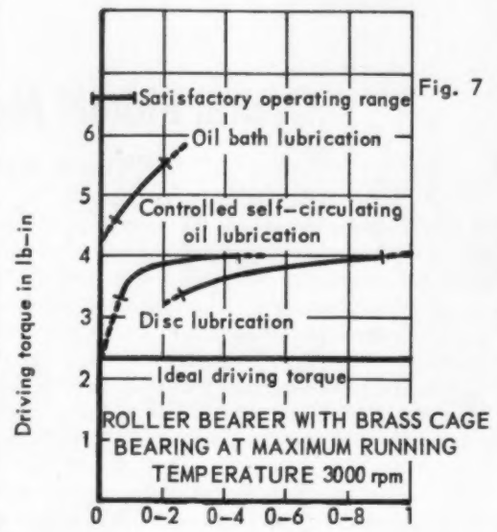


Fig. 7

Abstracted from a technical paper entitled "Self-Contained Oil Lubrication Systems for Rolling Element Bearings", presented at the AEI Fourth Summer School for Electrical Engineers. Further information can be obtained from Associated Electrical Industries, Ltd., Manchester, England.

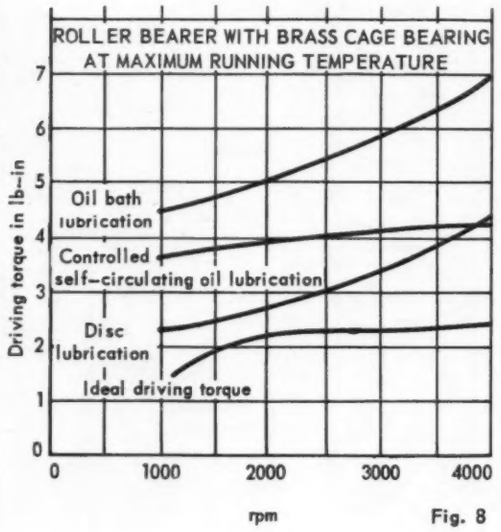
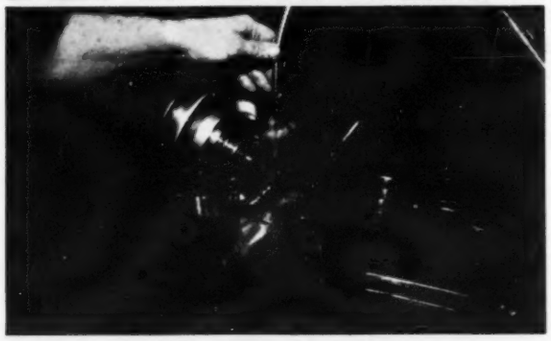


Fig. 8

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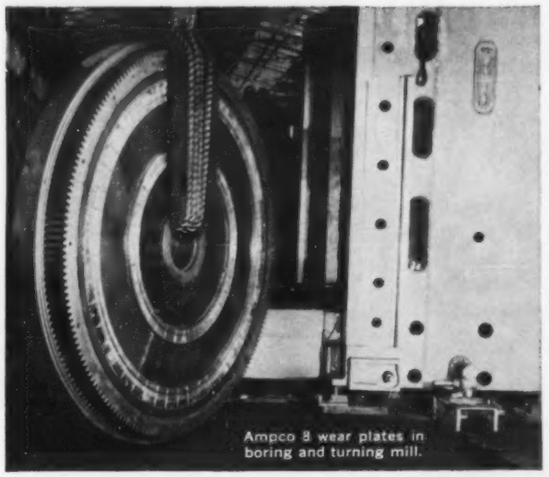
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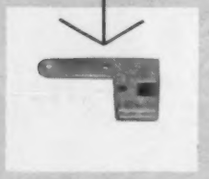
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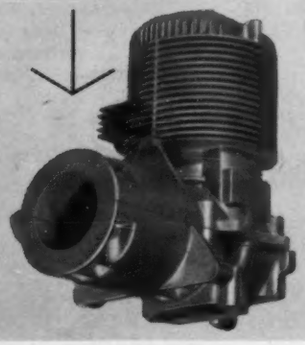
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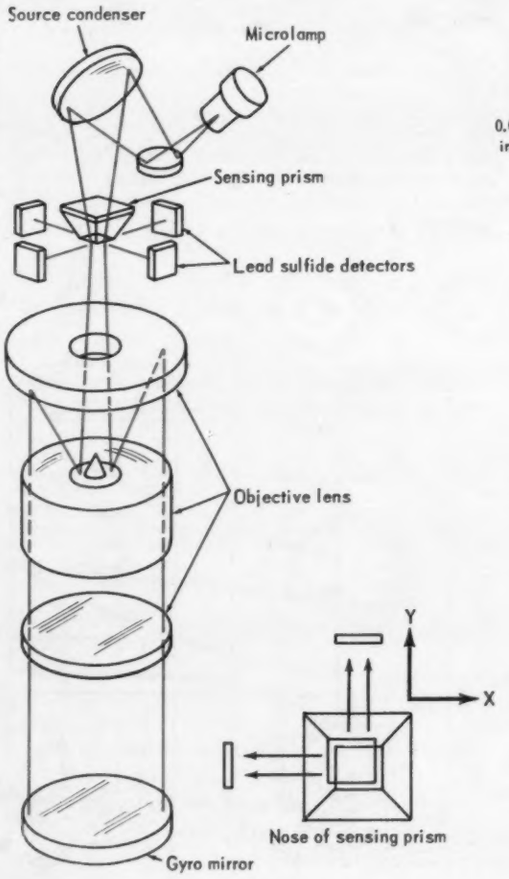
Optical Pickoff Monitors 'Super' Gyros

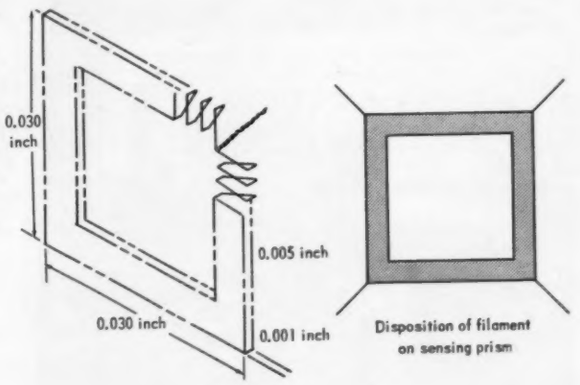
Victor W. Wigotsky, Eastern Editor

An optical pickoff monitors the precession of "super" gyros based on magnetic, electrostatic or air-suspended spherical rotors. Unit is a two-axis null-sensing autocollimator in which light is reflected by a gyro mirror and re-imaged to a sensing prism. Deviations of the gyro spin axis from the optical axis energize photodetectors. Resulting error signals then are applied to the gyro gimbal torquing servos to maintain the case accurately aligned with the rotor.

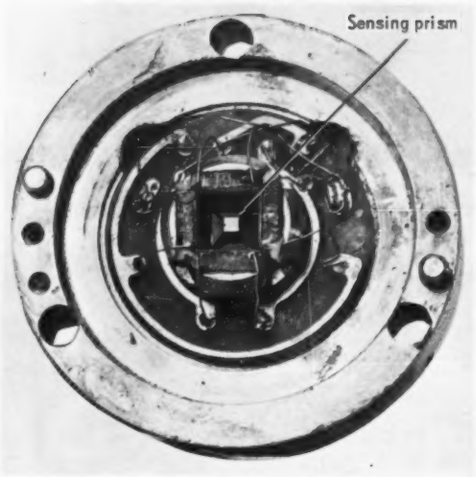
The miniature pickoff is placed along the spin axis approximately 1 inch from a flat mirror mounted on the gyro. The mirror is viewed by the pickoff through a 0.3-inch dia hole in the gyro case. Light from a lamp filament on the clear nose of the sensing prism then is collimated to the mirror by an objective lens. Any deviation of the spin axis from the optical axis (gyro precession) results in an off-center image on the prism nose. This shifts the null-balanced light pattern on lead sulfide detectors positioned to correspond with the gyro's "x" and "y" axes. Resulting signal to the torquing servos returns the system to its null condition.

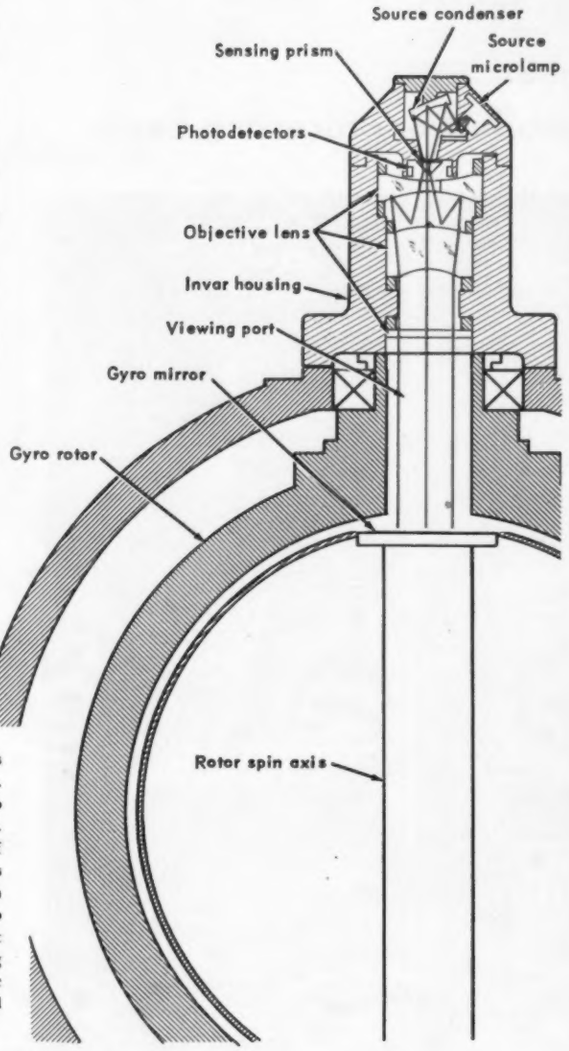
The "Optag" two-axis precession monitor was designed by Perkin-Elmer Corp., Norwalk, Conn.



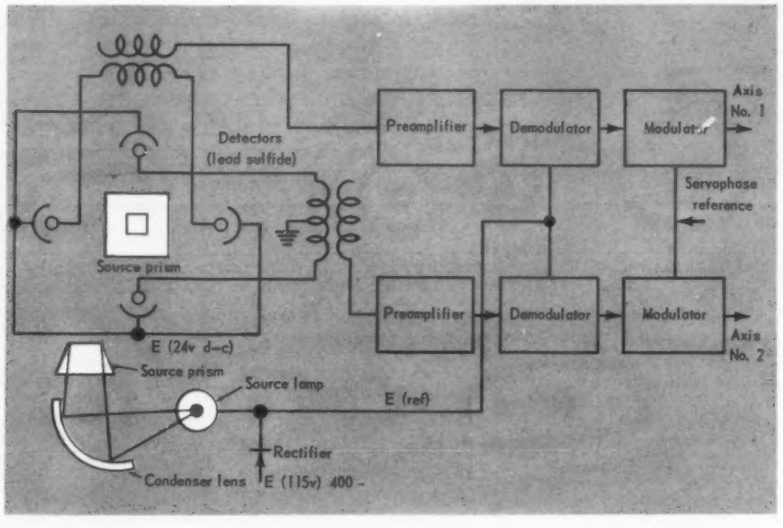


OBJECTIVE LENS collimates lamp filament image provided behind clear nose of sensing prism. Light image then is reflected by gyro mirror and re-imaged in plane of nose. Image is superimposed imperfectly on nose if mirror is not precisely normal to optical axis, thus indicating gyro precession. Light falling on sides of sensing prism then is reflected into photodetector. Resulting a-c error signal is amplified and applied to gyro gimbal torquing servos to maintain accurate alignment of case with rotor. Four lead sulphide detectors are used with single tungsten filament light source. Lamp is approximately 0.028 inch and constructed of four sections of coiled tungsten-filament wire 0.00025 inch in dia, wound on rectangular mandrels 0.001 by 0.005 inch in cross-section and 0.025 inch long. Sections then are arranged to form square whose outside dimension is slightly larger than sensing prism nose to insure against light discontinuity. Cross-coupling becomes significant only when errors are sizable portion of angle (2.5 deg, or 9000 sec) subtended by sensing prism nose. Since untracked error should never be more than few seconds in any precision gyro, this effect is inconsequential.





TWO-AXIS GYRO PRECESSION MONITOR features small size, low power consumption, long life and stability. Pickoff produces no significant reaction torque on gyro rotor. Instrument sensitivity is better than 1 sec of arc. Invar housing has similar expansion characteristic of quartz optics. However, small difference of expansivity is compensated radially to maintain all optical elements in line over temperature range. Attaching pickoff to gyro through Belleville-spring-clamped three-point kinematic base prevents angular motion of pickoff while permitting sliding relative to gyro mounting surface with temperature changes. This assures that optical axis will maintain fixed angular relation to gyro case.



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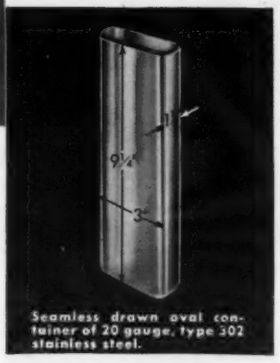
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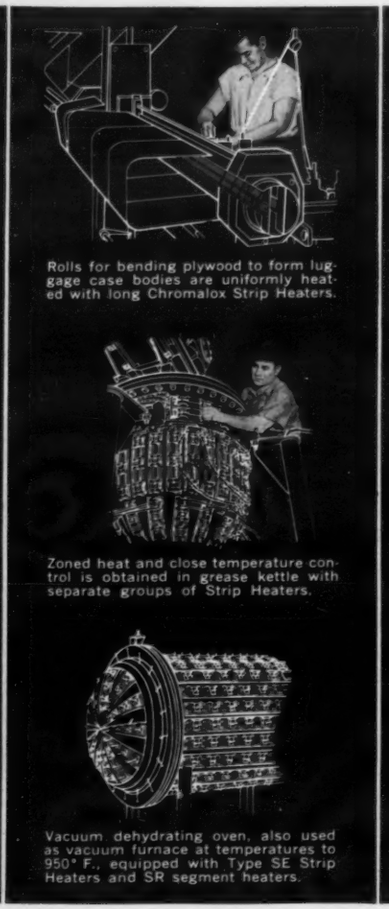
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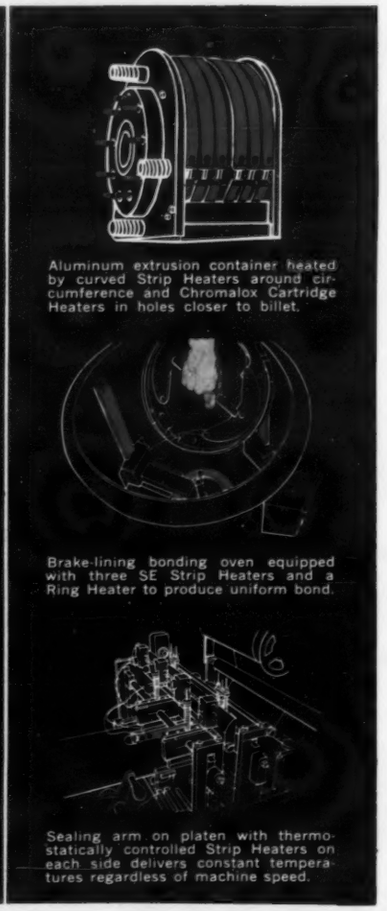
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Zoned heat and close temperature control is obtained in grease kettle with separate groups of Strip Heaters.

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Aluminum extrusion container heated by curved Strip Heaters around circumference and Chromalox Cartridge Heaters in holes closer to billet.

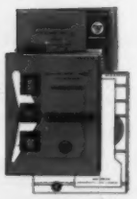
Brake-lining bonding oven equipped with three SE Strip Heaters and a Ring Heater to produce uniform bond.

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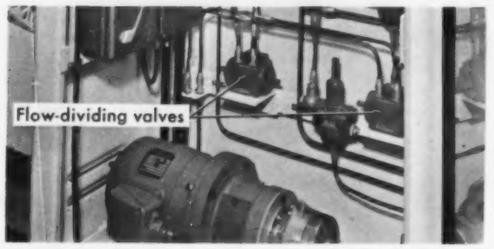
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Flow-Dividing Valve

Ronald W. E. Martin, British Editor



Problem:
In hydraulic systems, where two actuators work simultaneously from a single operating pressure, any difference in the loads on the actuators causes the operating rates to differ.

Solution:
A flow-dividing valve which insures equal flow-rates in two output lines. Equal flow is maintained irrespective of output-pressure variations.

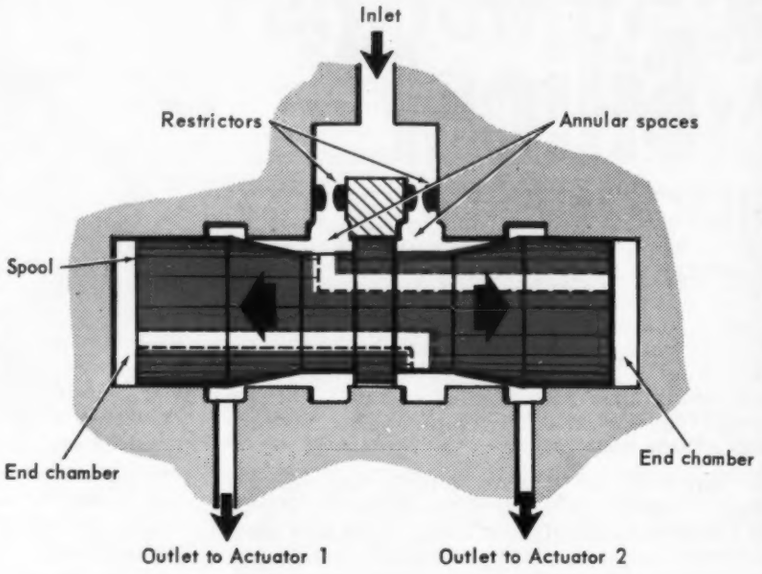
A spool moves in a closed cylinder and partially restricts the two outlet ports, the extent of the restriction depending on the exact position of the spool. High-pressure operating fluid enters the annular spaces between the spool and cylinder through two equal restrictions. Direct communication is provided, through ports in the spool, between respective annular spaces and end chambers.

Under steady conditions, the pressures in the annular spaces are equal. An increase in load on one of the actuators results in a transient increase in pressure in those parts of the valve to which it is connected. This moves the spool in the appropriate direction to restore the equality of pressures in the annular spaces. For example, an increase in load on the actuator connected to the left-hand outlet causes a pressure increase in the left-hand annular space and right-hand end chamber. As a result, the spool moves to the left, reducing the resistance of the restriction at the left-hand outlet and simultaneously increasing that of the right-hand outlet. This change in resistance of the flow paths to the two actuators maintains equal flow.

The flow-dividing valve was designed by Lockheed Precision Products, Ltd., Liverpool, England. Present range of valves is designed for flows up to 20 gpm and pressures up to 3000 psi. It is claimed that division of flow is accurate to within 0.5 percent of full rated flow for unit.

Insures Equal Flow-Rate to Actuator

RESTRICTIONS are of equal resistance and are fed from common pressure supply. As pressure in annular spaces also remains equal (except during transient disturbances), flows in both inlet lines are equal. Each inlet flow equals its respective outlet flow, so these too are equal, irrespective of pressures in outlet lines.



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Therefore, Almag 35 is the ideal alloy for casting components of instruments, computing devices, and other equipment where dimensional stability is of prime importance.

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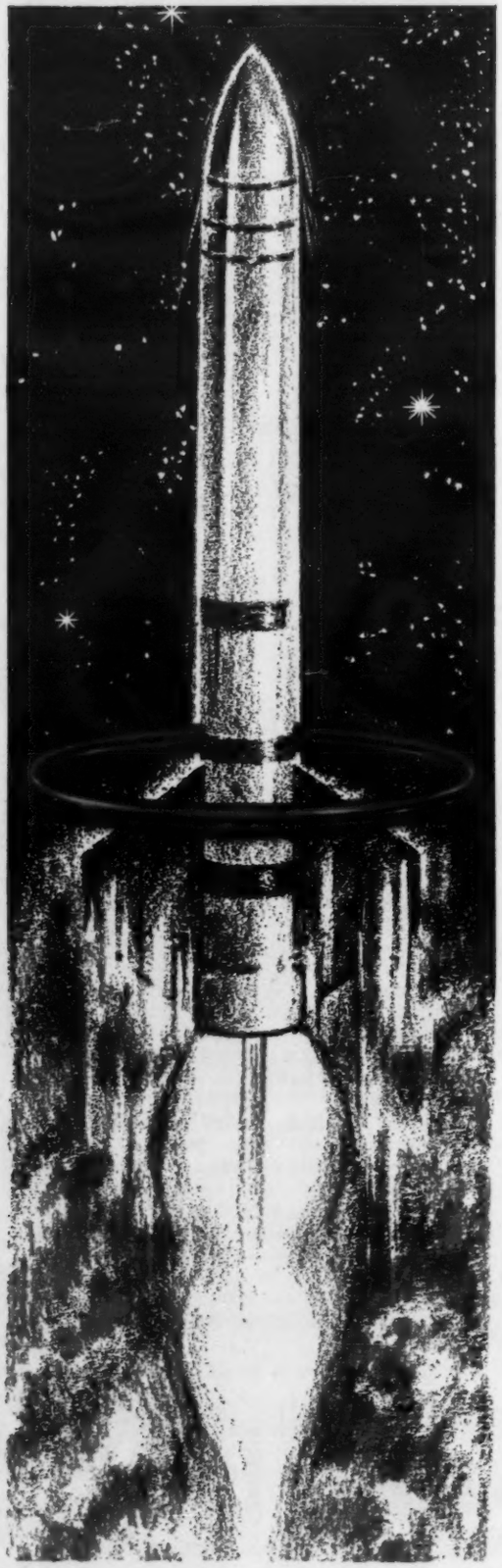


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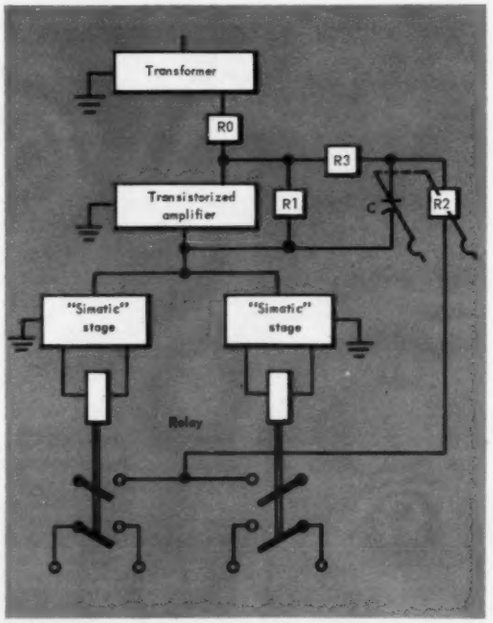
Integrator Minimizes Switching

R. F. Stengel, German Editor

A three-position control unit includes an integrator which permits relays to act only after the time integral of the error signal has reached a preset level. This eliminates response to random fluctuations, minimizes the frequency of switching and increases component life.

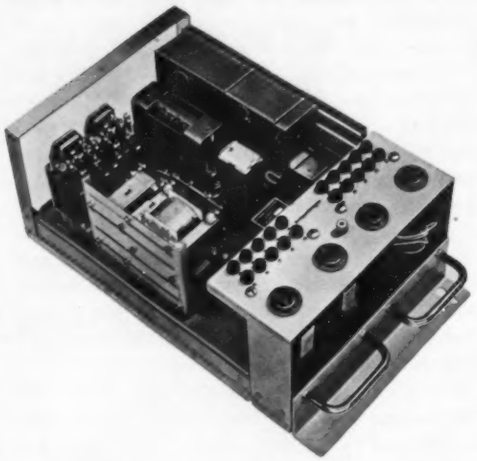
Signals arriving in a control loop typically contain statistical noise superimposed on true error signals. Noise peaks exceeding the sensitivity threshold may trigger conventional controls even when the process to be monitored is "on track". In the new three-position unit, integrator output consists of the time average of the error over a preset time interval, plus a fraction of the instantaneous error. When the sum exceeds the threshold sensitivity of the control unit, a servomotor is started and the accumulated time integral is reset to zero.

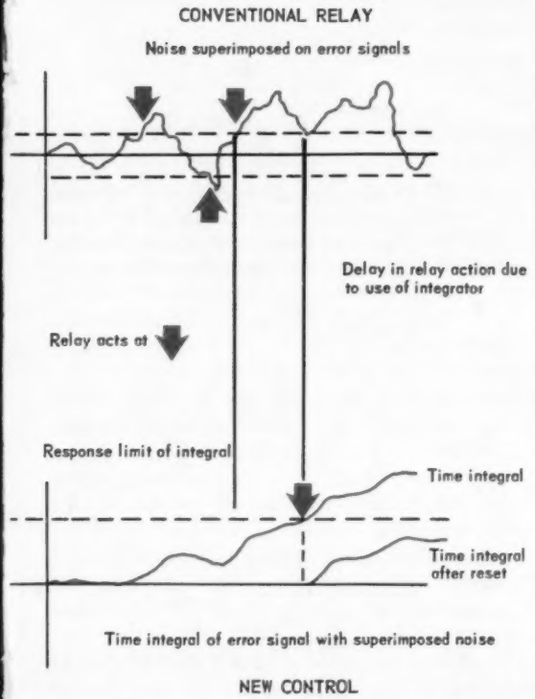
The integrator was designed by Siemens-Schuckertwerke AG, Erlangen, Germany.



TRANSFORMER converts error signal into d-c voltage. Resistors and condenser add integration effect to transistorized amplifier. R3 determines contribution of instantaneous error to integrator output. Reset signal is fed back through R2. Amplifier controls two "Simatic" stages and two relays.

Frequency of Three-Position Control



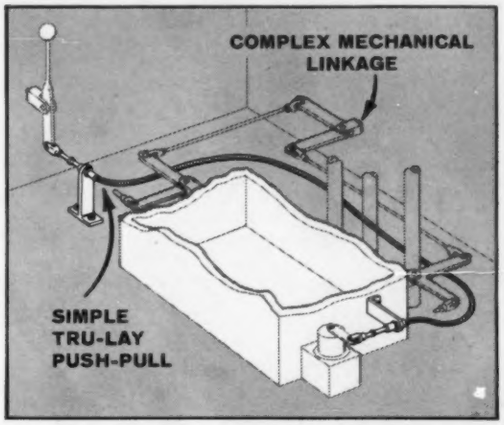


CONVENTIONAL RELAY acts when composite signal exceeds its sensitivity; first two actions are superfluous, caused by noise only. Bottom curve shows time integral of incoming signal. For simplicity, long integration time interval is assumed and portional contribution of instantaneous error signal is omitted. New control unit acts only as integrator when output exceeds preset level. Diagram also shows inherent disadvantage of integration effect: control response is delayed.

ACCURATE REMOTE CONTROL FOR HUNDREDS OF PRODUCTS

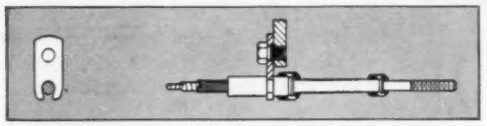
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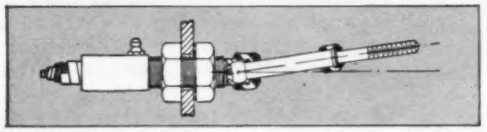


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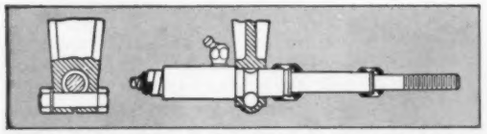
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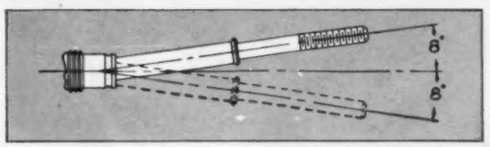


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HANDBOOK OF INSTRUMENTATION AND CONTROLS is planned to help the reader determine how to best select and effectively apply instruments and control systems for mechanical services in commercial and industrial buildings. The profusely illustrated volume extends from basic facts on instruments to thorough descriptions of complete control systems. It presents the information needed to procure, specify or design equipment. The handbook is arranged for instant reference and lengthy, complicated discussions are omitted. Technical aspects of instrumentation are conveyed visually through illustrations, tables, charts and graphs. Modern instrumentation and control practices are shown, and practical control applications are discussed. The broad scope of the publication also covers many specialized phases, including boiler and combustion controls, boiler flame-failure safeguards and the fundamentals of instrument systems design. This comprehensive handbook was authored by Howard P. Kallen. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N.Y.; $15.

CREATIVITY AND THE INDIVIDUAL, summaries of selected literature in psychology and psychiatry, is a publication of the Graduate School of Business, University of Chicago, contributing new knowledge and new ideas important in the practice of business. The work reflects the interest in potential contributions of behavioral sciences to the field of business administration and to our understanding of human behavior in general. Studies of creativity in the arts and sciences and the variety of characteristics of factors which motivate creative individuals are brought to light in this bibliography. Arguments for the importance of pregenital drives, defense mechanisms, the senses against the senses, insanity, sanity, the desire for immortality, the need for order, the significance of sublimation and the importance of self-actualization are brought forth. The reader will find as many points of disagreement as of agreement among the author's coverage. Excerpts of works included deal mainly with the individual, his characteristics and the process through which he arrives at the creative product; writings of others have been included where they deal with a specific issue, or treat an issue in a specific manner that was not covered elsewhere. This volume is the third in the McKinsey Foundation series of annotated bibliographies. Morris I. Stein and Shirley J. Heinze; The Free Press, 119 W. Lake St., Chicago 1, Ill.; 428 pages; $10.

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B-8-CW B-8-CCW	1/50	4.0	14	1750	2.7
B-10-CW B-10-CCW	1/40	4.7	18	1750	3.1
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HANDBOOK OF MECHANICAL WEAR, edited by Charles Lipson and L. V. Colwell, comprises a number of lectures on various aspects of wear, including causes and remedies. The papers examine different wear processes such as corrosion, abrasion, spalling, pitting, and cavitation and fretting which result in wear. Comprehensive information is provided on such factors as material composition, environment and history of the manufacturing operation. The amply illustrated volume concludes with a final section summarizing the findings of the 17 papers presented. The University of Michigan Press, Ann Arbor, Mich.; 469 pages; $20.

AN ENGINEERING APPROACH TO GYROSCOPIC INSTRUMENTS fills the gap between preliminary explanations of gyroscopic effects and complicated derivations of gyroscopic motion. Starting out with a few special cases, sufficient mathematical formulation is introduced for solving quantitative relations of gyroscopic problems. Principles formulated are applied to basic gyro configurations of today's gyroscopic instruments. A few "exotic" gyro designs are presented including air bearings, electrostatic and electromagnetically supported gyros, vibrating gyros and particle gyros in which the spin momentum of the hydrogen atom is active. A number of actual gyroscopic instruments that are used in ships, aircraft and missiles are subjects of the final chapter. Elliott J. Siff and Claude L. Emmerich; Robert Speller & Sons, Publishers, Inc., 33 W. 42nd St., New York 36, N.Y.; 120 pages; $7.50.

NONDESTRUCTIVE TESTING should increase the reader's effectiveness when conducting nondestructive testing and help him to arrive at more reliable results. The book discusses the practical methods in use today and scientific principles on which they are based. Each chapter is based on physical principles which underly a particular test method and special techniques resolving practical problems. Major testing procedures treated include visual testing, pressure and leak testing, liquid penetrant inspection, thermal methods, X-ray radiography, ultrasonics, dynamic testing, magnetic and electric techniques, and eddy-current methods. The book features a number of detailed illustrations and tables which highlight actual test procedures. Also included are chapters on thickness measurements and a section devoted to such specialized techniques as spot tests, sulfur printing, spectrochemical analysis and residual stress. Warren J. McGonnagle; McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N.Y.; 455 pages; $15.

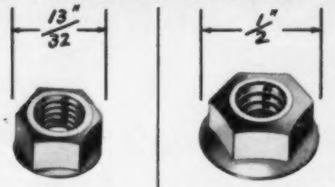
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WHIZ-LOCK FLANGETTE

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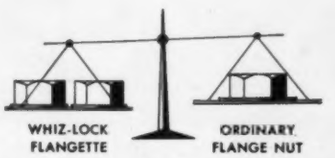
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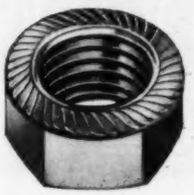
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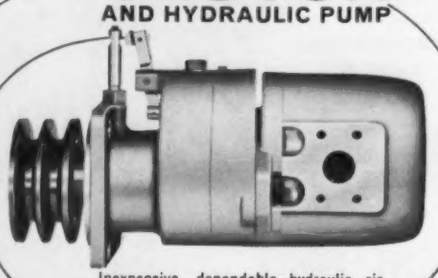
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BOOKS

INTRODUCTORY SYSTEM ANALYSIS: SIGNALS AND SYSTEMS IN ELECTRICAL ENGINEERING. Although written specifically as a text for electrical engineering students, this should be a good reference for those engineers in other fields involved with servosystems, analog simulation and computation. The writing style is unusually lucid for a rather complicated subject. A thorough background in mathematics is required by the nature of the subject. By William A. Lynch and John G. Truxal; McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York, 36, N.Y.; 452 pages; $7.50.

OPTIMUM DESIGN OF MECHANICAL ELEMENTS presents an explicit method of design which has evolved from the author's industrial and academic experiences in the design field. The method is referred to as a method of optimum design. It can be applied to many design problems and minimizes the "cut-and-try" practice frequently used. Ray C. Johnson primarily discusses design problems whose solutions depend on the employment of some theory. However, he does not preclude problems for which a satisfactory, if not an optimal, design solution can be obtained without a consideration of theory. He also provides many specific examples which are solved in detail and presents exercises which should give the reader an opportunity to test his mastery of the method of optimum design. Published by John Wiley & Sons, Inc., 440 Park Ave., S., New York 16, N.Y.; 535 pages; $11.50.

HIGH-TEMPERATURE METALLOGRAPHY. The first part of this volume, authored by M. G. Lozinskii, USSR Academy of Sciences, Moscow, deals with the construction and maintenance of vacuum apparatus and the special forms of specimens needed. Theoretical basis for the calculation of physical properties of metals and alloys as related to their behavior at high temperatures in vacuo is featured. The second part deals mainly with the practical applications of the methods. The author suggests new fields of investigation opened up by the flexibility of these methods. Challenging views regarding classification and interpretation of microcontours and methods of computation of some physical properties of metals and alloys are forwarded. Finally, a method is given for measuring selective vaporization which may find application in certain branches of the electrical industry and in powder metallurgy. Pergamon Press, Inc., 122 E. 55th St., New York 22, N.Y.; 484 pages; $17.50.

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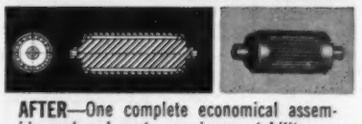
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PRINCIPLES OF INERTIAL NAVIGATION presents a collection of principles selected from numerous published papers on inertial navigation, originally prepared as a series of lectures to be delivered to graduate engineers working in this new and expanding field. The book covers the basic concepts of navigation and elements required for automatic navigation. It discusses the design of autonavigation components and computers, platform controllers, and ground alignment and preflight testing. Necessary theoretical information on inertial navigation principles is presented. Recent advances in ballistic guidance and aircraft guidance are included. C. J. Savant, Jr., R. C. Howard, C. B. Solloway and C. A. Savant; McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N.Y.; 254 pages; $9.75.

CENTRIFUGAL PUMPS. Igor Karassik and Roy Carter present a comprehensive reference book for users and designers of centrifugal pumps. The selection, operation and maintenance of component parts and pump drives are discussed. Other areas covered include performance characteristics, system-head curves, controls and priming of pump systems. This is a practical work, and theory is introduced only where it is essential to the understanding of specific problems in planning, selecting, operating and maintaining pump systems. Included is one chapter on what the buyer should know about the conditions of service before ordering a pump and another chapter discusses trouble-shooting, installation and general maintenance. A data section which applies to all makes and types of centrifugal pumps completes the book. F. W. Dodge Corp., 119 W. 40th St., New York 18, N.Y.; 496 pages; $15.75.



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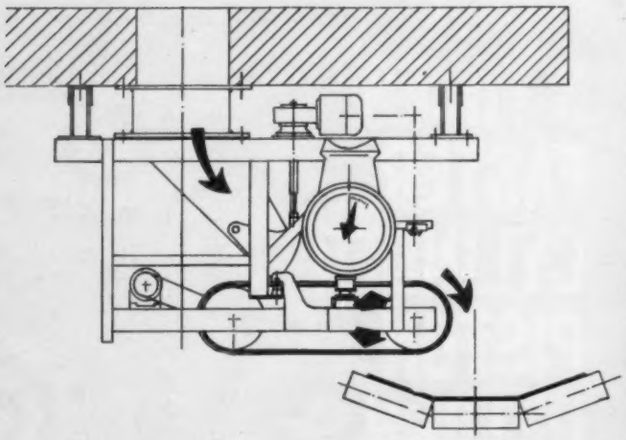
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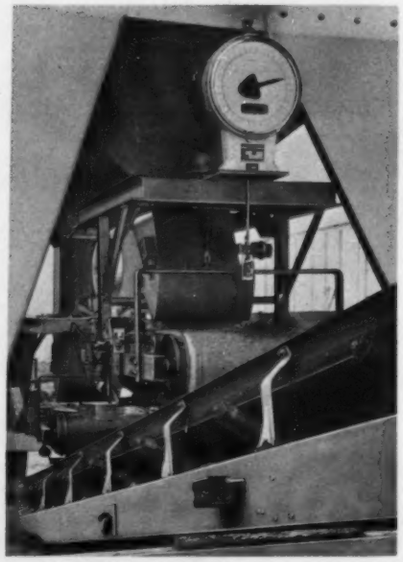
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DESIGN NEWS

IDEAS IN THE NEWS

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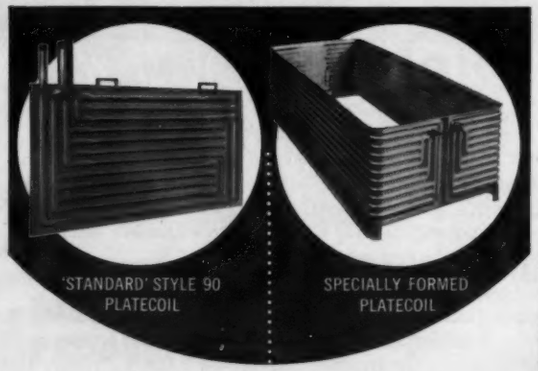


AUGSBURG, GERMANY—A short conveyor, pivoting around one end, transmits the weight of feed material on it through a mechanical linkage to a display scale. Weight deviations are fed back to a gear motor actuating the hopper discharge gate which admits material to the conveyor.

The self-contained unit is suspended from the hopper floor. Material flows from storage bins through a steep duct and the discharge gate onto the metering conveyor, which is driven at a preset constant rate. For known material properties and conveyor speeds, the throughput depends on the gate position only.

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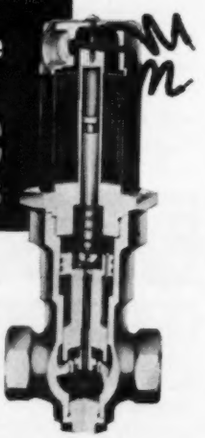
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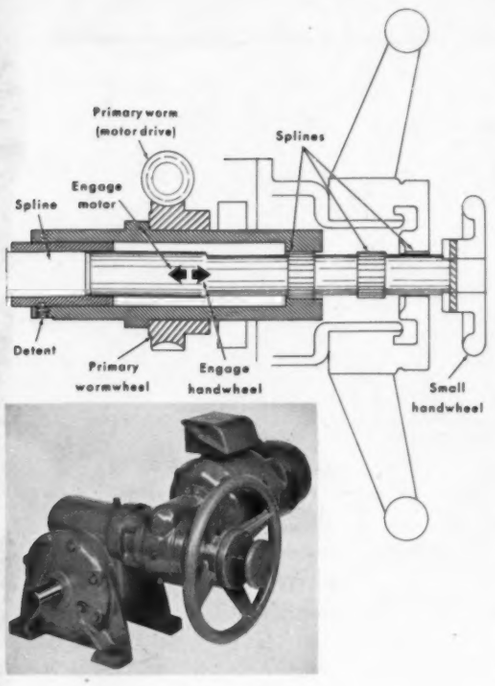
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When the shift wheel is pulled out, the primary gear reducer is disengaged and the large handwheel is engaged for manual operation. At all times, the shift wheel will rotate when the drive is actuated either by the motor or manually. However, there is never any danger of the large handwheel turning at primary gear-reducer speed. The shift wheel always gives visual proof when the motor is actuating the drive.

The Electra-Combustion Control Drive is a development of Electra Motors, Inc., for industrial valve operation. E.W.S.





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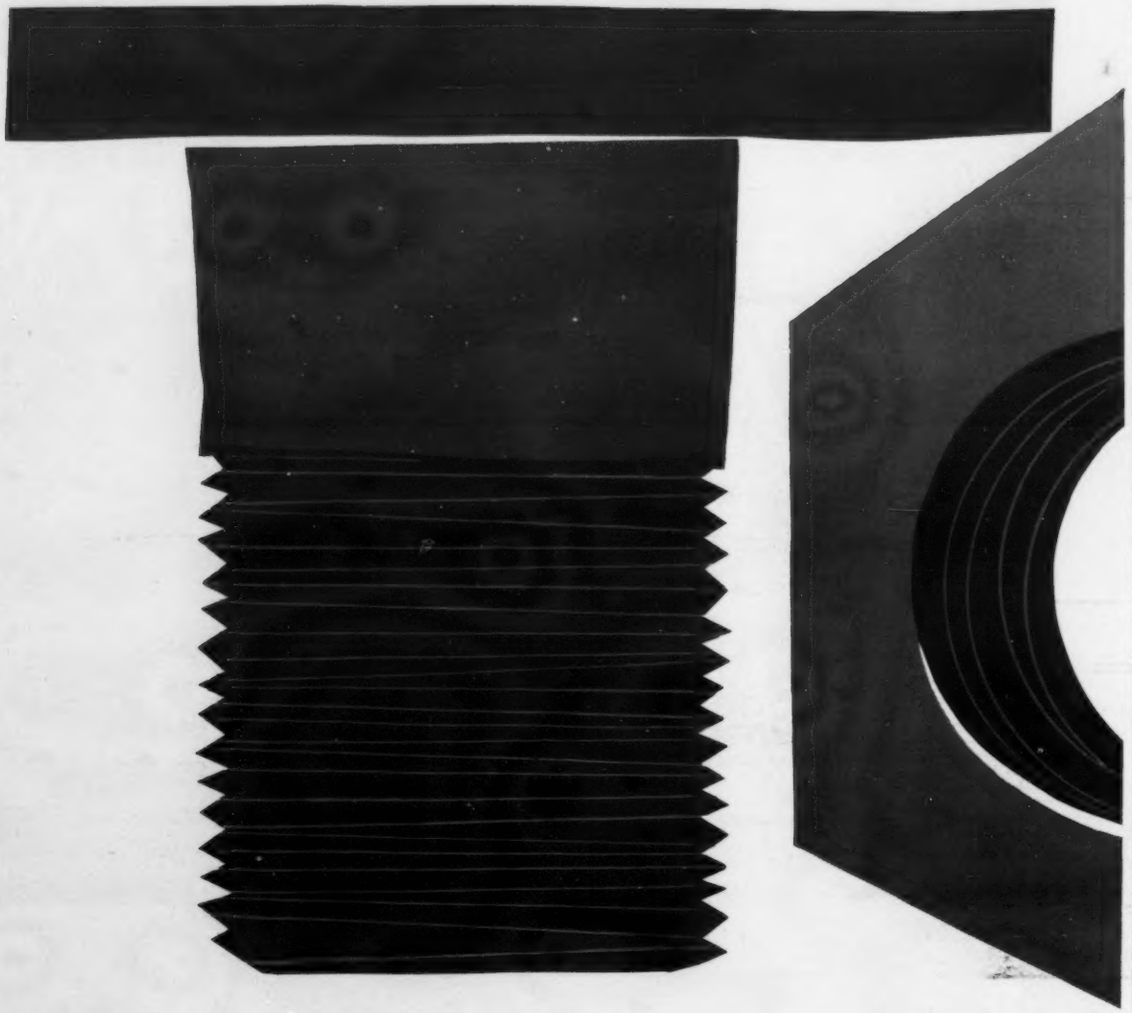
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IDEAS IN THE NEWS



• AMERICA'S FIRST helicopter-carried air-defense control system is being used in field training with the U.S. Marines in the Mojave desert.

The first two of four electronic tactical systems are "training" at Twentynine Palms, Calif., with the 1st and 2nd Light Anti-Aircraft Missile Battalions, which use Hawk guided missiles. Two additional systems will join the Marines later this summer. One will be assigned to the 1st Medium Anti-Aircraft Missile Battalion, which uses Terrier guided missiles.

The system, developed and manufactured for the corps by Hughes' ground systems group, coordinates the firing of Hawk and Terrier missile batteries to assure nearly instant destruction of hostile supersonic aircraft.

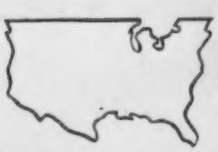
The air-defense equipment is installed in five "helihuts"—plastic and aluminum shelters about the size of the van of a 2-1/2-ton truck—which are transported underneath Marine helicopters.

Designated AN/TSQ-39, each system consists of an operations central helihut and four coder-decoder helihuts.

Helicopters also transport supporting radars for the operations central.

→

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Cullman Distributors are located from coast to coast and border to border; therefore you are assured of always getting fast service on Cullman power transmission products. When you want Sprockets, Roller Chains, Flexible Couplings—call on Cullman for prompt delivery.

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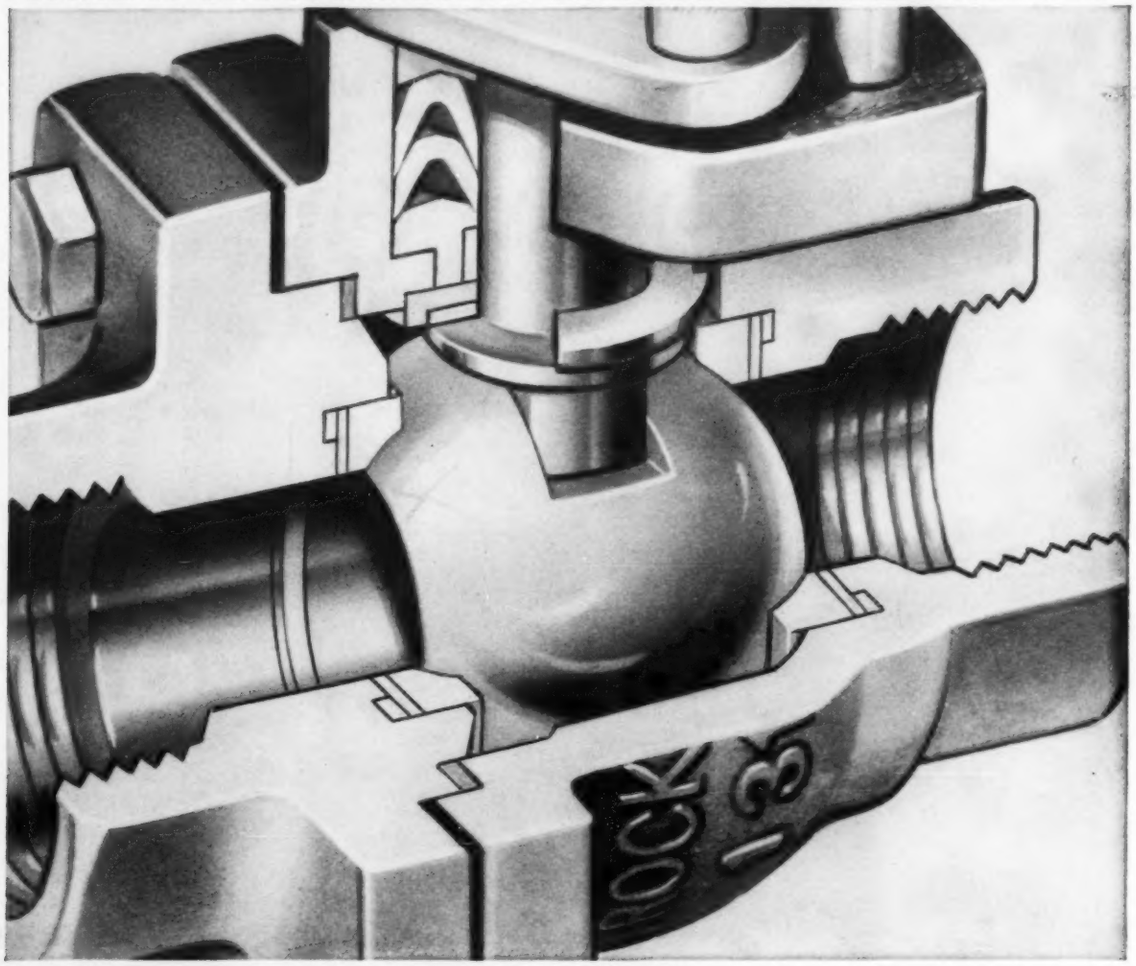


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Time-proven dependability. Rockwood was the first to manufacture a commercial ball valve, which still sets the standard of quality in ball valve design.

Get the complete details from your Rockwood man or write Rockwood Sprinkler Company, Ball Valve Department, 855 Harlow Street, Worcester 5, Mass. Distributors in all principal industrial areas. Rockwood Sprinkler Company, A Division of The Gamewell Company, A Subsidiary of E. W. Bliss Co.

ROCKWOOD

BALL VALVES

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• HORIZONTAL BORING MILL with modification saws opens Navy practice mines for visual inspection.

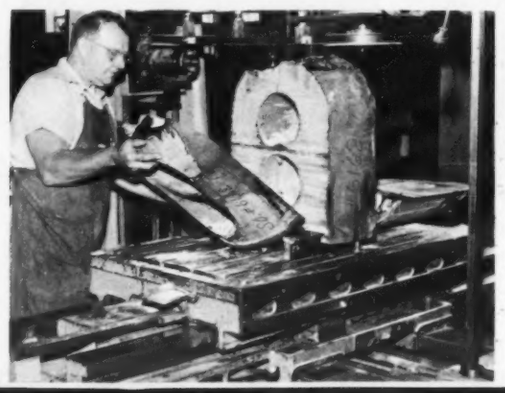
When two mines undergoing long-duration pressure tests at U. S. Naval Ordnance Laboratory in Silver Spring, Md., experienced an unusual structure failure, scientists were prompted to "have a look see" inside them to find out why.

Sawing two 5-inch-thick vertical slabs off the side of a 20-inch-dia aluminum mine case some 2-1/2 ft long and filled with cement, tar and vermiculite is no ordinary task. NOL discovered that its standard saws were not capable of performing work of this size and complexity, nor could commercial services of this nature be obtained. As a consequence, the Lab's Technical Shops Div. was faced with the task of designing and building a special saw to handle this project and others of a similar nature.

Given the basic performance requirements, the manufacturing branch promptly suggested utilizing a horizontal boring mill modified to rotate an 8-ft-long bandsaw blade. This blade was fitted around two specially constructed "Bakelite" pulleys, 10 inches in dia, mounted one each on the mill's auxiliary vertical milling head and its tailstock. The shaft holding the pulley on tailstock end of the mill was the tilting type to insure that the blade would properly track on both pulleys. Downward pressure was provided by guides and rollers which also kept the blade straight as it revolved around the pulleys.

During the sawing operation, the blade was fed downward at the rate of 1/4 ipm to simultaneously cut two 5-inch-thick vertical slabs off the side of each mine. Total cutting time for each mine was approximately two hr.

Leadingman model maker Charles Maple designed the unique saw and David Kowalchik, machinist maintenanceman, built the device.



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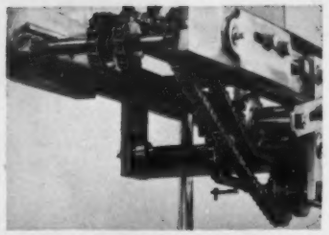
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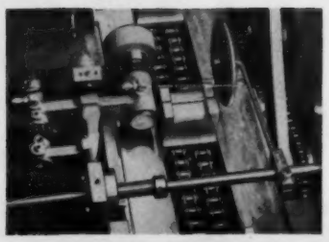
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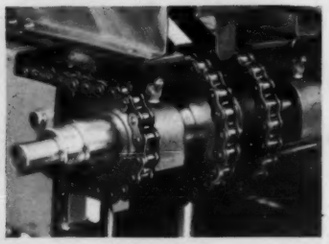
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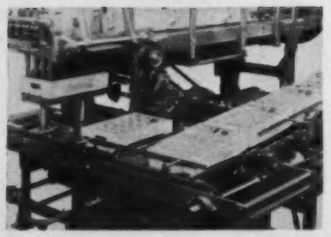


2 Will I be furnished with fast engineering service to solve my design problems and get the most efficient installations?



3 Can I get off-the-shelf service and immediate delivery on all my requirements from an authorized local distributor who specializes in the handling of Acme Power Transmission Products?

4 Will I receive the personal cordial attention of top executives thoroughly experienced in efficient use of roller chains with a willingness to help me with my engineering problems?



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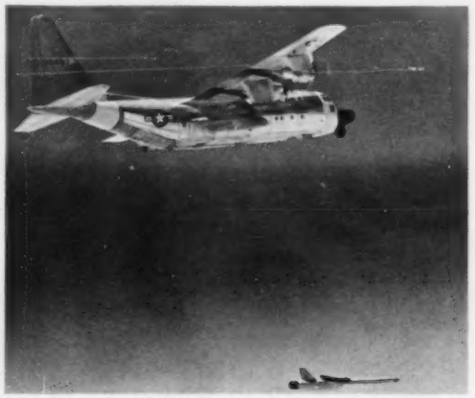
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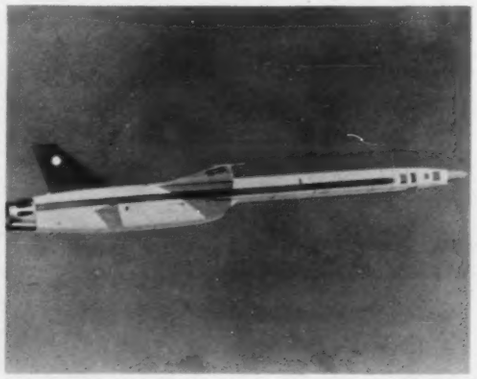
IDEAS IN THE NEWS

• **U. S. NAVY** has scheduled a flight test program utilizing the Q-4B Supersonic drone as a target for the Talos missile.

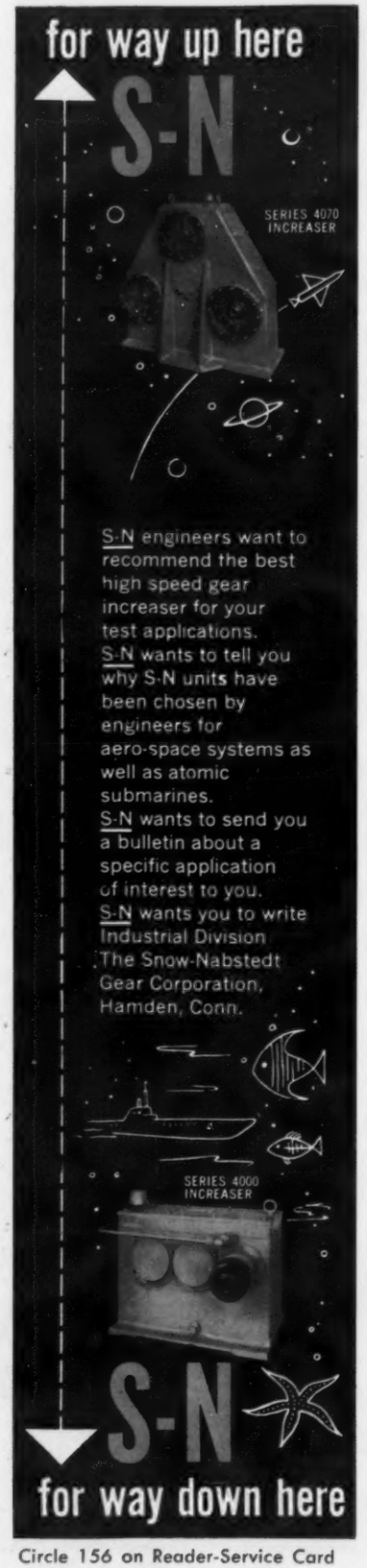
Powered by a General Electric YJ85-GE-5 jet engine with afterburner, the Q-4B is the latest in the series of Q-4-type drones developed by Radioplane (Div. of Northrop Corp.) for the Air Force as a supersonic target for air-to-air and surface-to-air defensive weapon systems. Radar-guided and equipped with electronic devices to give the appearance of an aggressor bomber, the Q-4B also may carry special scoring equipment to register the kill-ability of missiles fired against it, even though the target does not suffer a direct hit. When the drone is not destroyed in flight, it is recovered by parachute for reuse.



SIMULATING AGGRESSOR BOMBER, the Mach 2 Class Q-4B target drone is launched from GC-130A aircraft on mission to test effectiveness of defensive weapon system. The Q-4B is capable of attaining a speed of Mach 2 in level flight and an altitude of 70,000 ft.



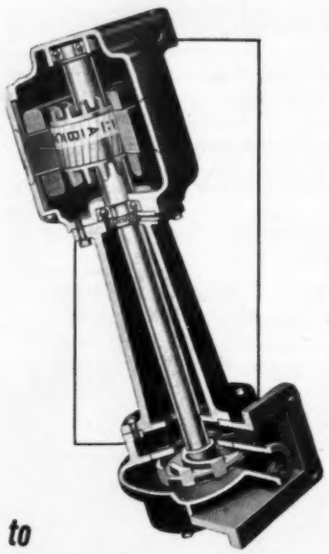
ACTUAL FLIGHT PHOTOGRAPH of Q-4B target drone shows simulated aggressor bomber steady on course as its radar control pilots it through a mission.



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MISSION COMPLETED. Jet-powered target drone is shown after satisfactory parachute recovery at Holloman AFB, N. M. In order to minimize possibility of damage upon landing, impact bags are provided. They are deployed and automatically inflated during descent and absorb much of landing shock upon ground impact.

•**CERAMIC SPONGES** for nuclear waste disposal have been developed by Coors Porcelain Co., Golden, Colo.

Use of ceramic materials with various techniques for the disposal of radioactive wastes has been considered since 1952, but the approach taken at Coors has resulted in the development of a simplified method which may be a solution to one of the nation's most difficult nuclear problems.

Present plans for testing of this disposal concept require Coors to manufacture highly porous spheres or sponges of an especially developed ceramic composition. At Los Alamos Scientific Laboratories, these will be soaked in radioactive waste solutions and dried repeatedly until a predetermined amount of liquid waste is absorbed by these sponges.

The sponges containing the absorbed waste then will be passed through an especially designed tunnel kiln where they will be heated to about 2400F. This heat treatment will vitrify or partially fuse the sponges to form glassy spheres in which the dangerous radionucleides permanently are entrapped. The spheres can be stored easily with little danger that the encapsulated radionucleides will escape.





AERO-SEAL JET® WORM DRIVE HOSE CLAMP

Designers know that sometimes even a relatively simple device is almost impossible to imitate, and AERO-SEAL has proved this point in the hose clamp field. The patented AERO-SEAL JET, for example, provides all of the advantages—including the security—of a precision worm drive clamp, yet permits almost instantaneous installation or removal. And AERO-SEAL bands and housings are of 302-18-8 stainless steel. All stainless also available.

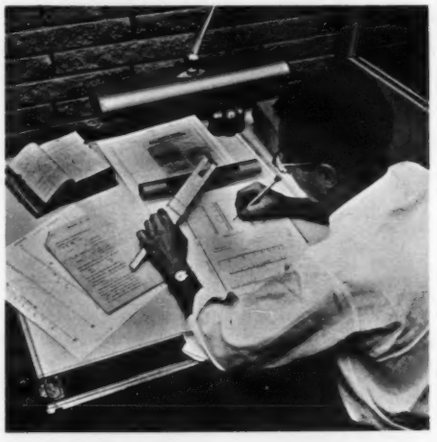
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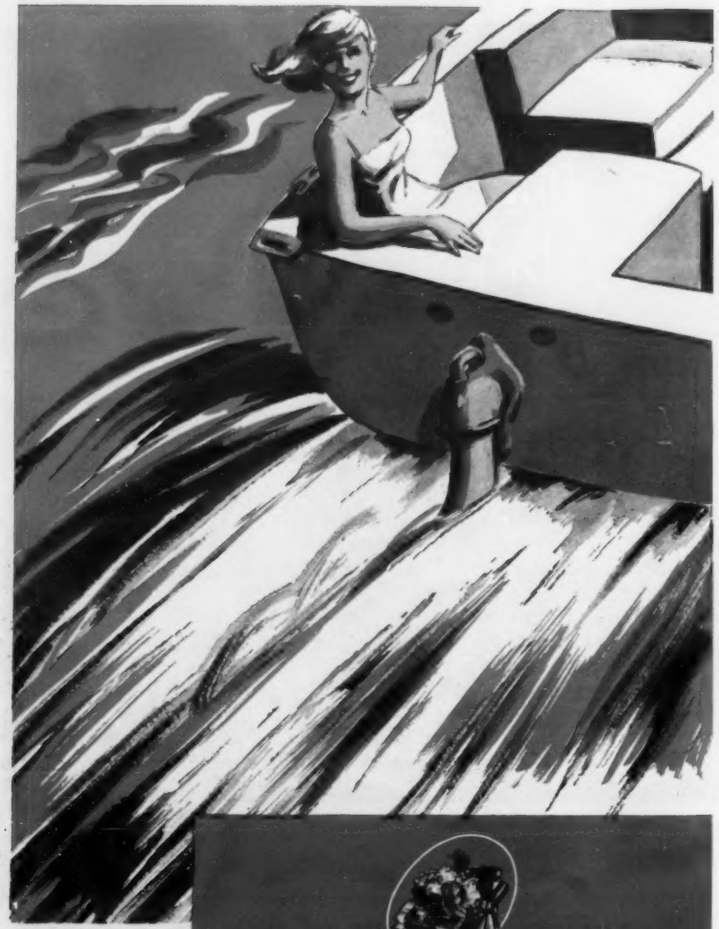
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DESIGN DATA NEWS



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IDEAS IN THE NEWS

• **AN OPTICAL INSTRUMENT** actually permits its operator to "see" in two directions at the same moment.

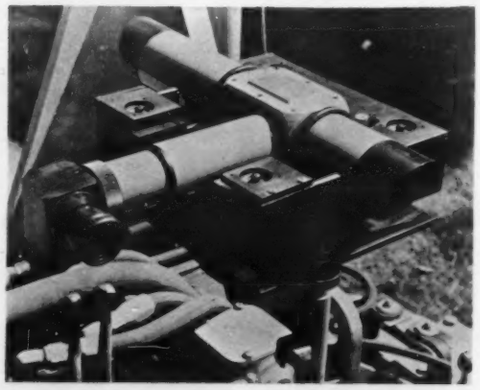
Designed primarily for track-leveling applications on railroad right-of-ways, the instrument also may have application in road leveling, bridge-building and construction work. Unlike split-image rangefinders, which project two separate images side-by-side, the instrument, called a Hoganscope, actually superimposes images from front and rear, permitting the viewer to see both simultaneously for increased accuracy in determining rail height over longer distances.

In track-leveling operation, the Hoganscope is mounted on a track ballast tamping machine and lines up on two mobile targets which are mounted on the rails and placed in front and at the rear of the scope at distances varying from 25 to 100 ft.

The operator can see a red line on the front spotboard target, a green line across the rear spotboard target and a black line bisecting the image and representing the horizontal axis of the instrument.

By bringing the red and green lines coincident, the operator determines from a scale the apparent distance between the target images and the black line cross-hair of the instrument. He then raises the track with a tamping jack until the three lines are superimposed or coincident and the track is at the desired elevation with accuracy to 0.032 inch.

Special optics for the scope were designed and are manufactured by Simpson Optical Mfg. Co., Chicago, in cooperation with Donald J. Hogan & Co., which developed the instrument idea.





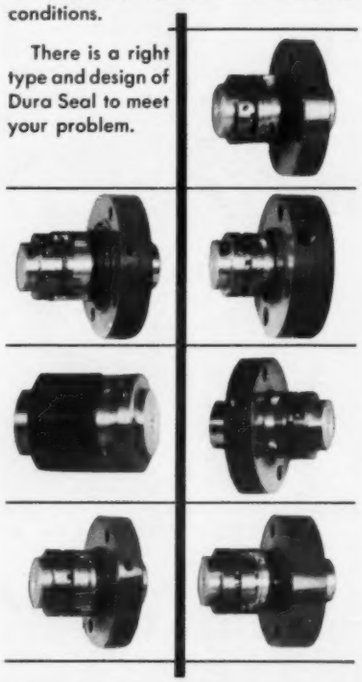
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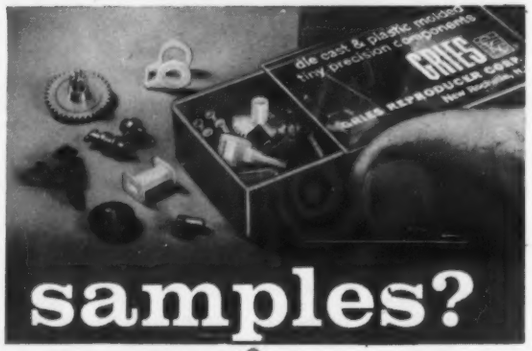


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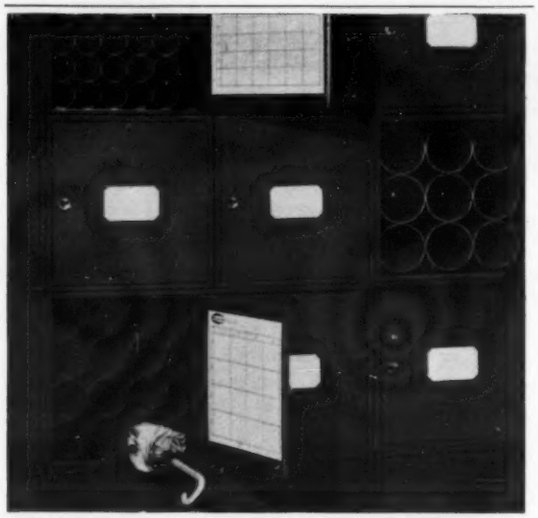
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• **SPACE SCIENTISTS** have predicted that the U.S. can orbit an experimental high-altitude, 24-hr, communications satellite in 18 months.

Within a year and a half of go-ahead, using "hardware" that is already space-proven, J. Douglas Sailor, Lockheed Missiles & Space Co. scientists, said America can place an experimental repeater satellite in equatorial orbit 22,300 miles above a fixed point in the Atlantic ocean. At this altitude, its orbital speed would be synchronized with the earth's rotation.

A single synchronous satellite over the Atlantic, because of its high altitude and the fact that it remains fixed over a point on the equator, would provide continuous telephone coverage between points in the Eastern U.S., Europe, South America and Africa.

The combination of an Atlas booster, a Lockheed Agena B and a small solid-fuel third stage could place a payload of several hundred pounds into a 24-hr equatorial orbit. Short-lived research shots would verify the method of orbit attainment, orbit perturbations or irregularites and vehicle systems performance. These would be followed by prototype vehicles to check out communications system performance and vehicle reliability.

The repeater satellite itself would be solar powered, using folding solar-cell arrays which would give it a box-like appearance. As a measure of space-tested reliability of solar arrays, similar equipment on Vanguard I is still operating after more than three years in orbit.

Another capability of the proposed satellite would be that of "station-keeping". Using a system that already has been devised and tested. the satellite would be able to hold within allowable limits its variations from assigned position.

It would appear that the telephone lineman of tomorrow may work a "line" 22,300 miles out in space.

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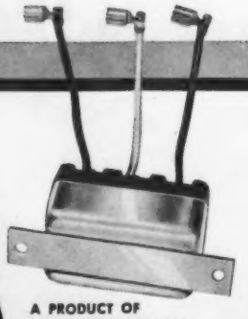
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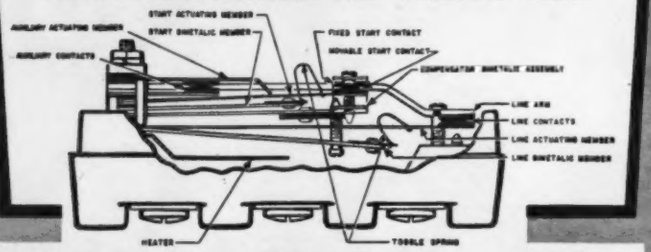
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THERMO-ELECTRONICS
COMBINATION OVERLOAD AND STARTING RELAY



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2. AMBIENT COMPENSATION: With ambient temperature changes, *compensator bimetallic assembly* flexes same amount as *start bimetallic member;* maintaining constant relationship between *start contacts.*
3. OVERLOAD PROTECTION: As temperature of *line bimetallic member* increases, it flexes upward till pre-set temperature is reached. *Toggle spring* rapidly forces *line actuating member* down; opening *line contacts,* disconnecting motor.
4. "DERATING CHARACTERISTIC" allows full advantage to be taken of compressor output without sacrificing overload protection.
5. LOCKED ROTOR: When this occurs, *start bimetallic member* flexes upward, opening *auxiliary contacts.* Current now passes through *heater* and *line bimetallic member,* which flexes upward and causes *toggle spring* to open *line contacts,* disconnecting motor.

Thermo-Electronics' excellent Combination Overload and Starting Relay will give maximum protection and efficiency over thousands of cycles. That's dependability. The three "bimetallic members" responsible for the proper operation of this unit are Chace Thermostatic Bimetal. Chace Thermostatic Bimetal is known the world over for dependability. More than a third-of-a-century of specializing in producing precision thermostatic bimetal has made Chace the recognized leader in its field. Specify Chace Thermostatic Bimetal and you specify DEPENDABILITY!

Send Now For Our New "Information Booklet"!

It contains many well illustrated pages of valuable design data and examples of successful applications of bimetal! More than 40 types of Chace Thermostatic Bimetal are available in coils, strips and completely fabricated elements of your design.

IT BENDS WITH THE HEAT

W. M. CHACE CO.
Thermostatic Bimetal
1612 BEARD AVE., DETROIT 9, MICH.

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IDEAS IN THE NEWS

• **POLYESTER RESIN** reinforced with fiber glass forms the entire outer body of the Avian 2/180 gyroplane, a new concept in VTOL aircraft.

Referred to as the "backyard aircraft", the plane combines elements of helicopter and gyroplane design. It is capable of taking off in the manner of a fixed-wing airplane or, with an auxiliary drive to the rotor, it can achieve a "jump" takeoff.

Reinforced "Hetron" (registered trademark of polyester resin reinforced with fiber glass, Hooker Chemical Corp.) was selected for the aircraft because of its unusual combination of strength, light weight and resistance to fatigue. It is an excellent fire-retardant material, an extremely important property in aircraft manufacture.



REINFORCED, FIRE-RETARDANT "Hetron" polyester, possessing unusual strength, light weight and fatigue resistance, proved to be an essential factor in development of the Avian 2/180 gyroplane.

Safety is a key factor in the operation of the Canadian craft. It is nonspinnable, nonstallable and can accomplish spot landings. If the engine should fail, the aircraft will windmill safely to the ground. It is reportedly simpler to operate than a conventional airplane or helicopter. Operating cost is approximately $0.06 per mile.

Normal cruising speed is 130 mph, with a maximum speed of 180 and a range of 480 miles. Useful load of the two-passenger craft is 600 lb.

The gyroplane was designed and built by Avian Aircraft, Ltd., Georgetown, Ontario, Canada.

LET MUELLER MAKE IT!

Mueller Brass Co. of Port Huron is much more diversified than the name "Brass" implies . . . a lot more. In fact, because of its many and varied facilities . . . its *men, methods* and *metals* . . . Mueller is in the unique position of being able to offer true single source service.

MUELLER HAS THE MEN . . . experienced engineers with the ability to work out, creatively, tough design problems, and improve a part or components for production by the most economical method. You get sound engineering plus 44 years of practical metalworking production experience when you "Let Mueller Make It."

MUELLER HAS THE METHODS . . . when you "Let Mueller Make It", you are utilizing one single source that is able to produce parts any one of these ways: as forgings, impact extrusions, sintered metal parts, screw machine products, formed tube or as castings.

MUELLER HAS THE METALS . . . and the materials . . . to produce precision parts in aluminum, brass, bronze, copper, iron, and steel in hundreds of different alloys to meet each exact requirement.

In addition, Mueller Brass Co. has complete and modern facilities for performing all types of finishing and sub-assembly operations. Another plus value is nation-wide sales engineering service.

So, in the final analysis, no matter where you fit in the American industrial picture, whether you're making missiles or mowers . . . and no matter where you're located, it will pay you to LET MUELLER MAKE IT!

MUELLER BRASS CO.
PORT HURON 23, MICHIGAN

Circle 167 on Reader-Service Card



• BLOOD PRESSURE of an astronaut orbiting the earth will be transmitted back to earth by telemetry, using an automatic blood-pressure-measuring system.

The new AiResearch system, which has commercial applications, automatically records both systolic and diastolic blood pressure. It transforms these measurements into an electrical signal to ground readout stations.

McDonnell Aircraft Corp. awarded a contract to AiResearch for such a system. This will be used to record an astronaut's blood pressure during future Project Mercury orbital missions.

The measuring system could be an important aid to busy hospital staffs. When the system detects blood-pressure levels above or below preset limits, the warning could quickly summon medical attention.

The system consists of a sensing device, the familiar occluding cuff and an electronic transducer. To operate, the sensor is placed over a convenient artery, preferably the brachial in the arm. The unit is sensitive enough to record through a suit coat and overcoat. Sensor is located in the cuff, which is inflated and gradually deflated as in the present method of recording blood pressure.

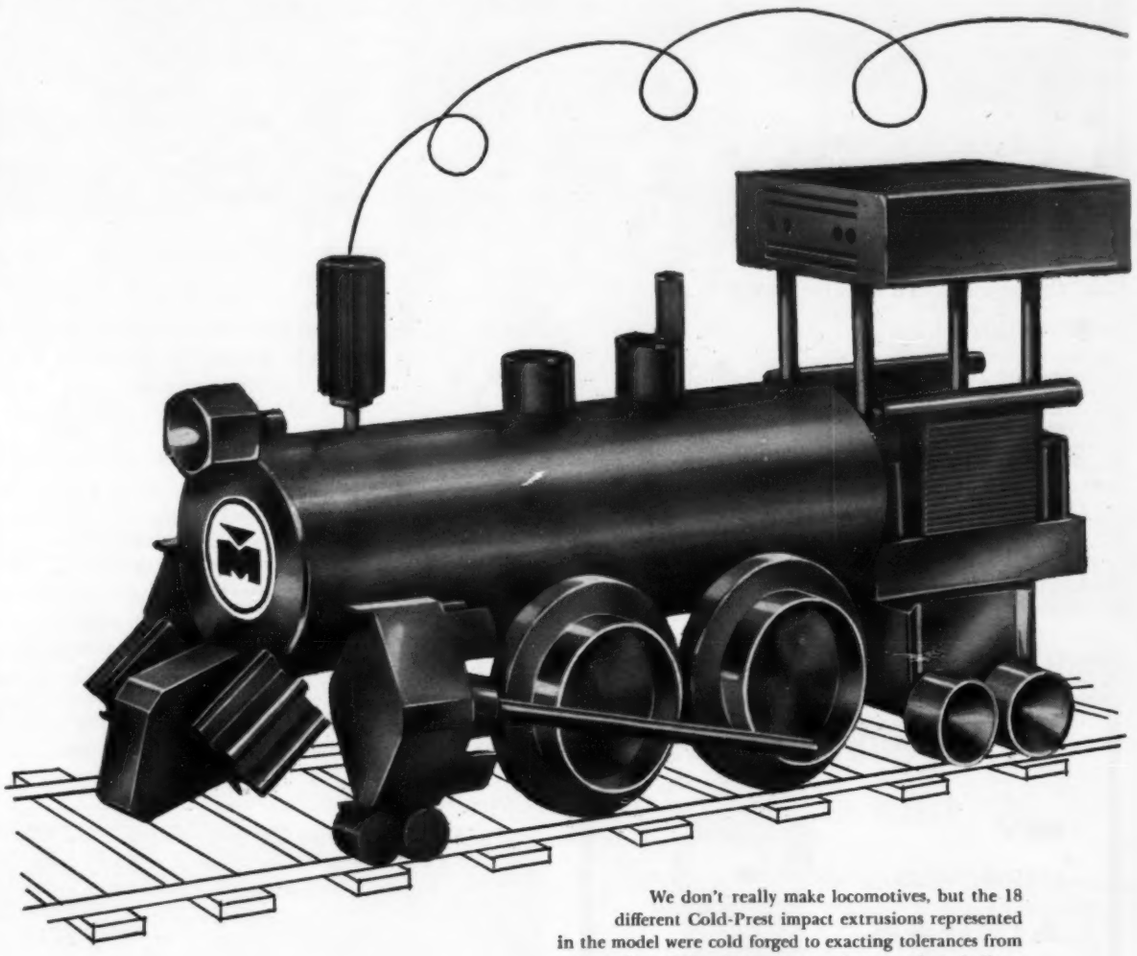
During deflation, sensor picks up all cardiovascular sounds and feeds them to an electronic transducer in the form of an electronic signal.

In Project Mercury, an oxygen cylinder filled to approximately 200 psi will be used to inflate the cuff. It will be inflated to 220 mm of mercury and deflated. This cycle requires 30 sec.

During launch, the astronaut's blood pressure will be taken for 6 minutes. In orbit, it will be recorded every 30 minutes in addition to being operated six times over various ground-control centers.

The system occupies an envelope measuring 0.11 cu ft. It weighs under 4 lb and is capable of operating 144 cycles (12 hr at 5-minute intervals).

MUELLER CAN MAKE MOST ANYTHING IN IMPACT EXTRUSIONS...



We don't really make locomotives, but the 18 different Cold-Prest impact extrusions represented in the model were cold forged to exacting tolerances from a number of aluminum, copper, brass, and steel alloys.

These parts are employed in products ranging from door closers to missiles. Mueller has also made important advances in the production of copper impact extrusions that are especially adaptable to electronic applications. Cold forgings are precision produced to exacting tolerances and offer the additional advantage of a better finish and appreciable metal savings.

Mueller's flexible facilities for the production of Cold-Prest Impact extrusions make practical long or short runs of simple or relatively complex shapes on an economical basis. In addition, the entire Mueller engineering staff, excellent machining, finishing and assembly facilities are readily available to you when you . . .

LET MUELLER MAKE IT!

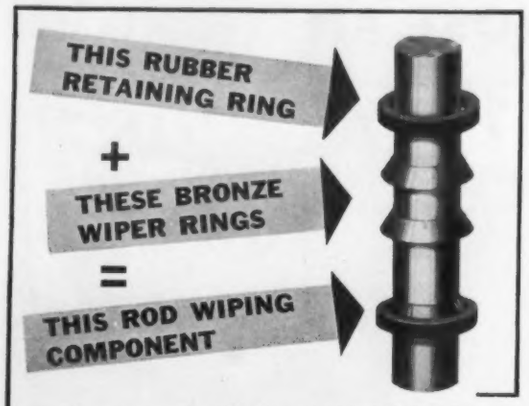
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PORT HURON 23, MICHIGAN

Write today for Engineering Manual No. FM-3019



344

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the efficient **SEAL-GUARD®**

KEEPS DIRT OUT!

Modern *Seal-Guard* keeps hydraulic and pneumatic systems clean—protects packings and entire system. Two knife-like bronze wipers throw all contaminants outward as rod retracts into cylinder. Rubber retainer absorbs shock and side load, holds wipers in full contact with rod and provides an overall outside seal.

Send for all the facts on Seal-Guard. Write E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

Houghton

INDUSTRY'S PARTNER IN PRODUCTION

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NEW IMPROVED AIRPAK FILTER-REGULATOR



An improved, inexpensive reducing-relief type regulator and air filter combination. Widely used Conoflow Airpak provides clean, filtered air for pneumatic controllers, automatic machines and similar air-operated equipment. A highly efficient, compact and rugged unit, easily installed and quickly serviced. Filter removed for cleaning simply by loosening one capnut. Available in materials, ranges and dripwell capacities to suit all conditions. 300 psi pressure rating. ¼" NPT connections.

WRITE FOR BULLETIN H

CC 109

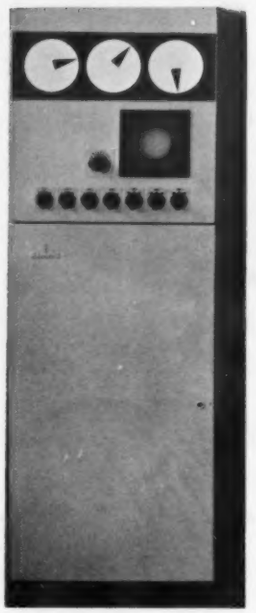
CONOFLOW CORPORATION

FOREMOST IN FINAL CONTROL ELEMENTS

2100 ARCH STREET, PHILADELPHIA 3, PA.

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IDEAS IN THE NEWS



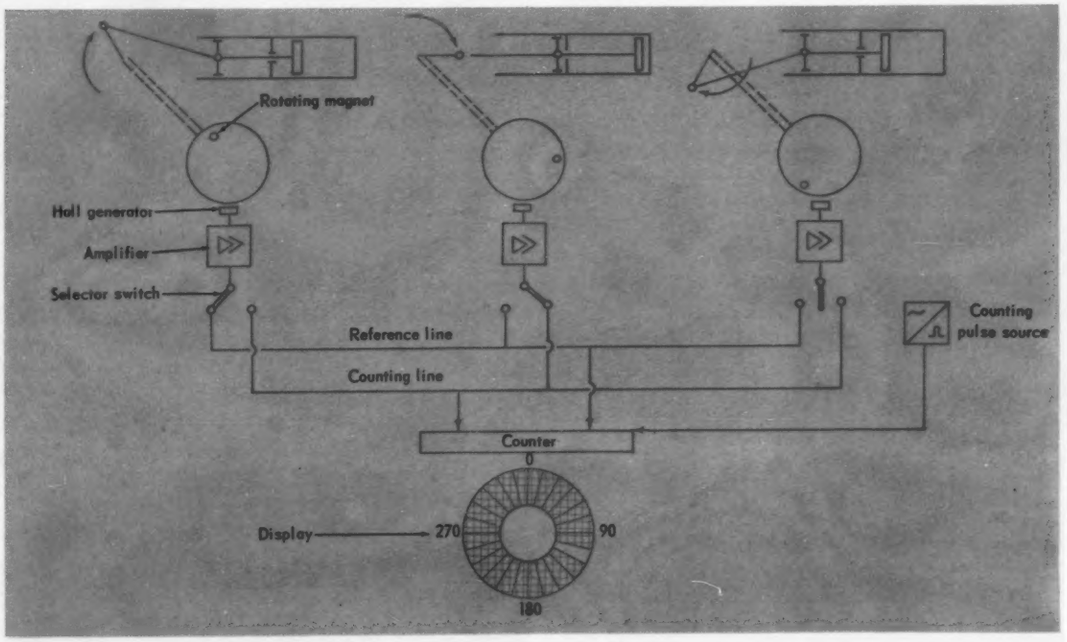
• **MONITORING SYSTEM** coordinates crank angles of reciprocating compressor sets to minimize vibrations in machine foundations and compressed-air lines. Intended for use with synchronous motors, the system operates with the line frequency as an index of crank-angle differences.

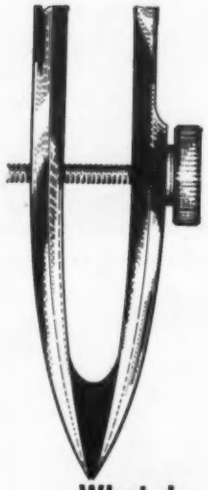
Each crankshaft carries an end disc to which a permanent magnet is attached. In passing a Hall generator, the magnet causes a short signal which is amplified. The signal initiates a binary pulse count based on line frequency; each pulse corresponds to rotation of the synchronous motor through the angle occupied by one pole pair. For a 48-pole motor, the count goes up to 24-inch increments of 15 deg, then repeats from zero. Angle count is displayed by segmented lighting of a disc divided into sectors; sector number again equals the number of pole pairs.

Crank-angle differences between any two compressors are determined by channeling the signal from one motor into the counting line, and the signal from another motor into a parallel reference line. As soon as the reference signal arrives at the counting unit, the crank angle count-up for the first motor is "frozen". The corresponding illuminated segment shows the relative crankshaft position of both engines.

After repeating the comparison for all compressors of the set, the display board shows an analog picture of all crank angles simultaneously. The counting signals can be compared with a crank angle pattern preselected for minimum vibration; differences between signals and preset pattern serve as synchronizing signals for the motor set.

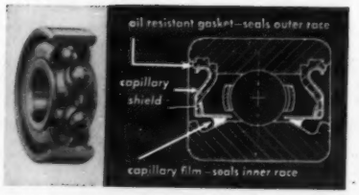
The digital crank-angle measuring system is a development of Siemens-Schuckertwerke AG., Erlangen, Germany. **R.F.S.**





What do Bow Pens have to do with Miniature Bearings?

They help us illustrate the principle behind our famous RMB Filmoseal construction. The ink in a bow pen is held in place by capillary action—so is the oil that forms the seal in the Filmoseal bearing. This means sealing is accomplished with no rubbing mechanical contact between rotating and stationary members.
Here's how it looks:



The advantages are obvious:

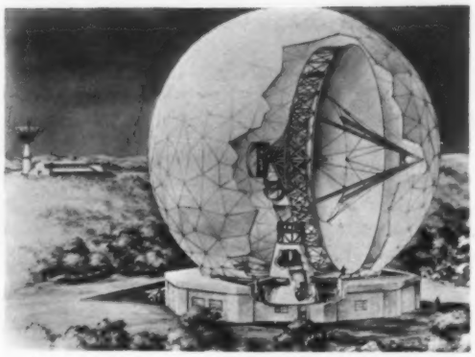
A SEALED BEARING WITH—
NO RUBBING FRICTION
NO INCREASE IN TORQUE

You can specify RMB Filmoseal bearings to *low cost* ABEC 1, or 5 or 7 tolerances. Sizes available range from .1875" OD/.0550" Bore to .8661" OD/.3150" Bore. Immediate delivery. Write for complete data.

RMB

LANDIS & GYR, inc.
45 West 45th St.
New York 36, N. Y.

Circle 171 on Reader-Service Card



• **HIGH-OUTPUT TRANSMITTERS** and power supplies being built for USAF space-probing "Haystack" antenna system may make it the most powerful radio research facility in the world. "Haystack" will be capable of probing surfaces of the moon or nearby planets, such as cloud-enveloped Venus, with a needle-sharp beam, or if used as a radar, "Haystack" will be able to detect a golf-ball-sized object 1000 miles away.

Due to be operating in 1962, "Haystack" will serve also as a test bed for development of large ground-based transmitting and receiving systems for use with satellite relays for around-the-world space communications. It will be capable of operation over a large range of frequencies and at power levels well in excess of presently available transmitting tubes.

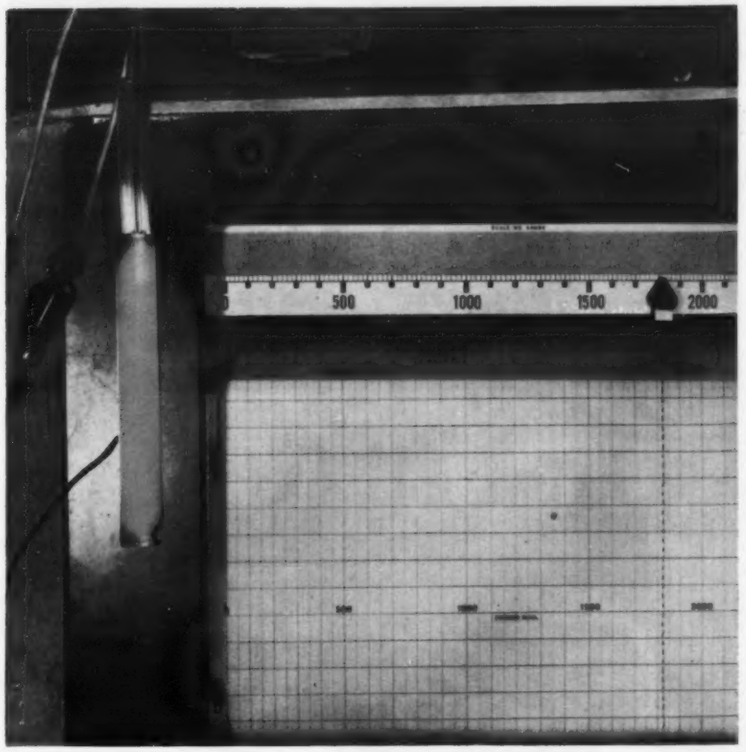
Under contracts totalling $1,651,000, Radiation at Stanford, Palo Alto, Calif., a subsidiary of Radiation, Inc., is building two unique 100,000w cw X-band transmitters and 1,000,000w power supplies for the antenna.

Radiation's general-purpose wide-range power supply will be used with all conceivable transmitting systems that may be built for "Haystack" in the future.

• **TURNBUCKLE** uses a lock clip arrangement which makes the device more easily inspected for safety and which provides stronger locking. The turnbuckle has a groove cut along the male thread of each terminal and a pair of grooves through the female threads of the barrel portion.

To lock the turnbuckle, the groove in the male thread is aligned with one of the grooves in the female and the straight leg of the locking clip is inserted in the hole thus formed. Hooked end of the clip then is sprung into the hole in the middle of the barrel, from where it can be removed only by destroying the clip.

Designated "Stuke Lock" and manufactured by S.A.R.M.A., Saint-Valliers-sur-Rhone, France, the turnbuckle has the advantage of saving many minutes of rigger's time locking each turnbuckle and of being made safe easily, thus cutting down rejections at inspection. R.W.E.M.



WATLOW'S FIREROD OPERATES 720 HOURS IN OPEN AIR AT 1800°F.

No other cartridge heater can match this!

Watlow's FIREROD® Cartridge Heater has outperformed every other heater on the market in rigidly controlled laboratory tests.

At a sheath temperature of 1800° F., a ½" o.d. FIREROD 2¼" long operated for 720 continuous hours rated at 90 watts per square inch. The unit was still operating satisfactorily at the end of this test while competitive so-called "high watts density" heaters had burned out. Under these conditions, standard cartridge heaters, manufactured on the techniques used before the introduction of the FIREROD, burned out in minutes.

Make your own comparison test. FIRERODS will save for you in three ways: Longer life, fewer replacements, and less space needed for required wattage. You can get FIRERODS, *best by test*, with deliveries of two weeks or less.

Write for Firerod Bulletin 367.

WATLOW
ELECTRIC MANUFACTURING COMPANY
1378 Ferguson Avenue / St. Louis 14, Missouri

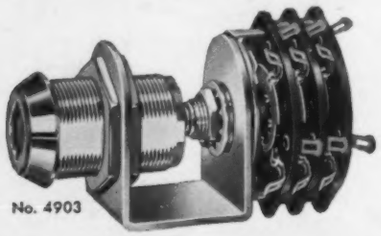
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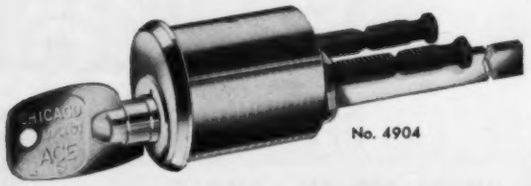
NEW

UNDERWRITERS' LISTED

CHICAGO ACE®
PIN TUMBLER LOCKS



No. 4903



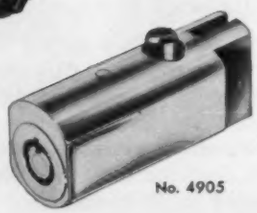
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Hardened Steel ACE Key

No. 4925



No. 4905

Here is the only line of locks listed by Underwriters' Laboratories. The unique ACE Locks provide the maximum in mechanical security. Over 80,000 keying combinations are possible so that you may have your own factory-registered tumbler set-up. For technical details on models available for various applications, write for Switch Lock Bulletin UB 501.

CHICAGO LOCK CO.

2038 N. Racine Avenue • Chicago 14, Illinois

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IDEAS IN THE NEWS

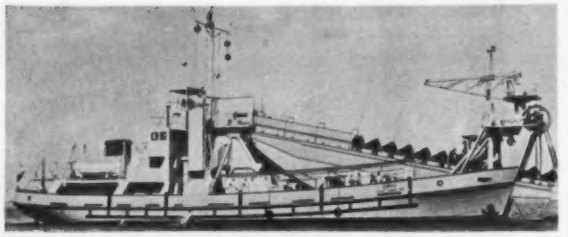
•**NEW BUCKET DREDGE** is said to be the first sea-going ship with hydrostatic main drive. In addition, bucket chain drive and winches also are powered by sets of hydrostatic pumps and motors. Advantages are infinitely variable power transmission, high starting torque and ability to shift power between main drive and bucket drive.

Prime movers are two 450-hp, 750-rpm diesel engines coupled with two 340-hp axial piston pumps. The pumps drive a set of three hydrostatic motors. Two of them act on a 2:1 stepdown gear to drive the propeller shaft; the third drives the upper bucket wheel. Chain has 46 buckets of 13 cu ft, runs at 10 buckets per minute.

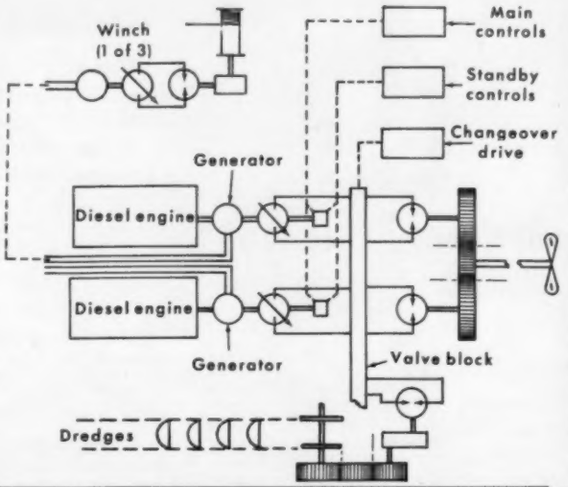
Power is shifted between propeller shaft and bucket drive by a valve block which also permits operation with only one set of engine-pump-motor.

Located on diesel takeoff shafts, two a-c generators supply ship's electrical system and power three electric motors which drive winches.

Dredge exceeds 7.5 knots at sea, was built by J. and K. Smit, Kinderdijk, Netherlands. Complete main drive, bucket drive and winch drive system was designed by Mannesmann-Meer AG, Moenchengladbach, Germany. **R.F.S.**



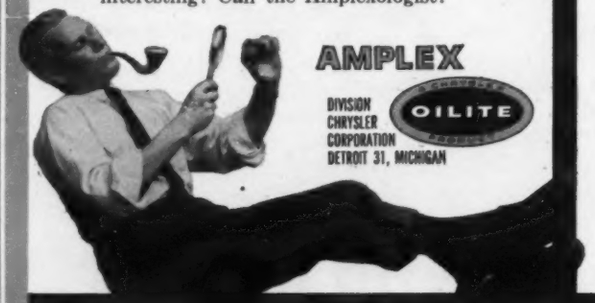
DREDGE "Kyant Khaing Yay" en route to Rangoon.



THE AMPLEXOLOGIST

powders a price tag

Originally, the part shown (double V pulley) was designed to be machined from steel. But before it was incorporated into a new model the Amplexologist was called in. Result: the part was designed for powder metal and is now produced as a finished precision part which requires no machining. Estimated saving 82%. Sound interesting? Call the Amplexologist!



AMPLEX

DIVISION CHRYSLER CORPORATION DETROIT 31, MICHIGAN

OILITE



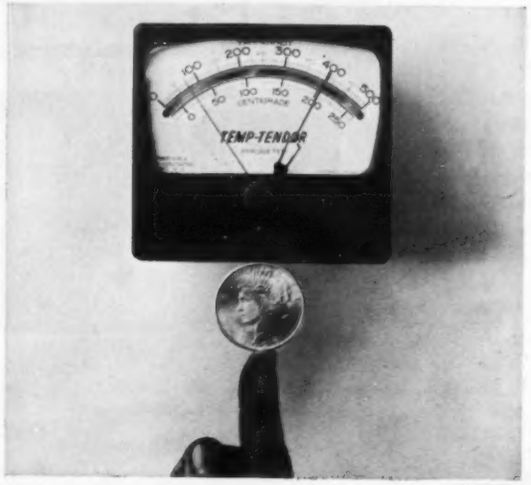
SEND FOR THE SECRET OF THE AMPLEXOLOGIST'S SUCCESS

1 ENGINEERING MANUAL
45 pages of technical information: How to determine correct applications for powder metal parts, bearings, filters.

2 NEW BEARING STOCK LIST
20 pages. 1066 standard sizes of Oilite self-lubricating bearings—bearing material. Selection guide, engineering data.

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A NEW, SMALLER TEMP. CONTROL AT A LOW OEM PRICE. A.P.I.'s compact Model 450 Temp-Tendor is a natural for building-in. It measures just 4" x 4¼" x 5½" overall, is as easy to mount as a panel meter, requires no more than a meter-sized panel space. • A complete time-proportioning control package, Temp-Tendor is capable of holding temperature to within ±1°F. of set-point, has built-in t/c length compensation adjustment, t/c break protection, and a number of other features usually found only in larger, more costly instruments. Data Sheet No. 24 will give you full details. Write for a copy.
ASSEMBLY PRODUCTS, INC. • CHESTERLAND 18, OHIO



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DO YOU NEED a low-cost source of metal fabricating?

Three large, well equipped plants at **Aurora, Ill., York, Pa.** and **Los Angeles** geared to economical production. Experienced in handling thousands of special items . . . products, parts, sub-assemblies, merchandising units, made to your specifications.

Modern equipment includes coil steel slitting, leveling and edging, press work, all types of welding, electrostatic finishing. Sound design and engineering counsel.



Send for 16-Page Booklet
It tells All!

LYON METAL PRODUCTS, INC.
General Offices, 988 Monroe Avenue, Aurora, Illinois

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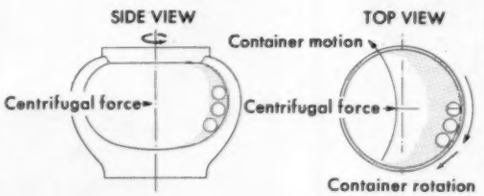


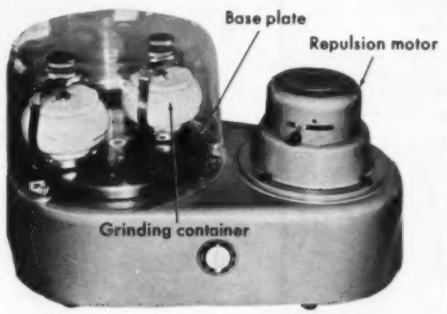
• **PLANETARY MOTION** of twin grinding containers accomplishes effective pulverizing and mixing while stresses remain low. Centrifugal force is applied to material in two stages: diametrically opposed containers rotate rapidly about their vertical axes on a common base plate which rotates in the opposite direction, more slowly and on a larger radius.

Containers hold in equal proportions spherical elements, grinding material and air. Spin forces material against container wall, while planetary motion on base plate causes spherical elements to move through material in circulation. Rotation speeds of containers and base plate have approximately 4:1 ratio, infinitely variable.

Spherical elements are small for mixing; pulverizing balls are larger, consisting of tungsten carbide with specific weight of 14.5. Effective volumes of containers vary from 150 to 300 cc depending on wall material (porcelain, agate, steel or sintered aluminum). Power source is an aircooled 110 or 220v repulsion motor. The "Plexiglas" protective hood carries safety contacts and motor runs only with hood in place.

"Fritsch Pulverisette 5" (patents applied for) was developed by Prof. Dr. Rumpf at Technische Hochschule Karlsruhe and is manufactured by Alfred Fritsch Laborgeraetebau, Idar-Oberstein, Germany.





measurement and control
OF PRESSURE AND DIFFERENTIAL PRESSURE



DELTADYNE® SWITCHES
Pat. No. 2,942,572
Adjustable for signalling pressure and differential pressure from 0.25" wc to 200 psi (or psid) in systems to 5000 psi and −65° to +275°F; leakproof. Units sound alarm, light bulb, turn motor on or off, operate valves—remotely or in place. **$40 to $75**

DELTADYNE INDICATORS
Adjustable and non-adjustable. Actuation 0.01 to 100 psi (or psid). For same pressure/temperature as switches. Red button pops to give visual indication of overpressure. **$22 to $85**



DELTADYNE GAUGES
For system pressures to 3000 psi; indication from 0 to 60 psi differential; leak-proof—no moving seals; high-visibility scale. **$92**



Extended pressure and temperature ranges available in all instruments.

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NEW ACCURACY!

OFF-THE-SHELF OR CUSTOM-ENGINEERED FOR

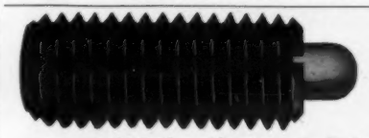
- Hydraulic/pneumatic systems (airborne, ground support, industrial)
- Process industries (chemical, petroleum, fuels)
- Equipment manufacturers (fluid handling)

Read or control tank levels, and pressure drops across filters, heat exchange orifices for flow metering, gas adsorbers and many other types of equipment. Learn more about the cost and service advantages of these units.

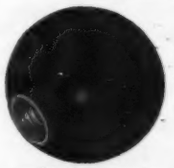
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PALL
PALL CORPORATION • GLEN COVE, N. Y.

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SPRING PLUNGERS are now available in four types and thirty-four sizes. Black Pentrate Nose with standard spring pressures, 6-32 thru 1"-8 threads. Cadmium Plate Nose with light spring pressures, 6-32 thru 1"-8 threads. Black Nylon Nose with standard spring pressures, 8-32 thru ⅝"-11 threads. White Nylon Nose with light spring pressures, 8-32 thru ⅝"-11 threads. Northwestern Tools, Inc., 115 Hollier Ave., Dayton 3, Ohio.



PLASTIC BALL KNOBS with brass inserts are now available in four diameters and twelve thread sizes. ¾" diameter with 10-32 threads. 1" diameter with ¼-20, ¼-28, 5/16-18 or 5/16-24 threads. 1⅜" diameter with ⅜-16, ⅜-24, ½-13 or ½-20 threads. 1⅞" diameter with ½-13, ½-20 or ⅝-18 threads. Northwestern Tools, Inc. 115 Hollier Ave., Dayton 3, Ohio.

SWING "C" WASHERS complete with shoulder screws, are now available in four sizes for ⅜", ½", ⅝" or ¾" bolt sizes.



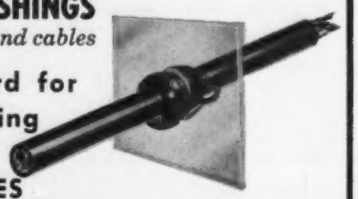
Write or call today for your free new 16-page cataolg. Catalog includes tracing templates of jig and fixture components. Northwestern Tools, Inc. 115 Hollier Ave., Dayton 3, Ohio.

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HEYCO NYLON BUSHINGS

HEYCO STRAIN RELIEF BUSHINGS
for standard and special wires and cables

The Approved Standard for Insulating and Anchoring ELECTRICAL CORDS & CABLES





HEYCO JUNCTION-TERMINAL BUSHINGS

Miniature insulated receptacle for use with 3/16" quick disconnect terminals. Completely insulated Nylon body.



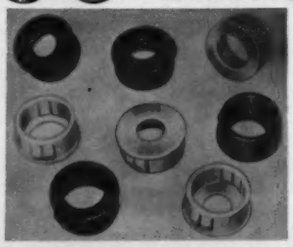
Snap-in Assembly - Color Coded
Eliminate "Pig-Tail" Wire Leads

NEW ACCORDIAN TYPE!



Adjusts and fits into curved surfaces. Available single or connected in units from 2 to 5. Color and Number coded. Mate with 3/16" or 1/4" female terminals

HEYCO Snap Bushings



Snap locks into panels up to 1/8" thick with finger pressure — 35 lb. push back test. 10 sizes for holes from 3/8 to 1 1/2" dia. various inside diameters.

Nylon provides complete electrical insulation and rugged mechanical protection for Electrical wire & cable — Tubing & hose–Rope & cable–Bearing surface for moving parts.

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FREE SAMPLES! IT'S EASY TO GET FREE TRIAL SAMPLES OF ALL HEYCO BUSHINGS—WHICH ONES WOULD YOU LIKE?

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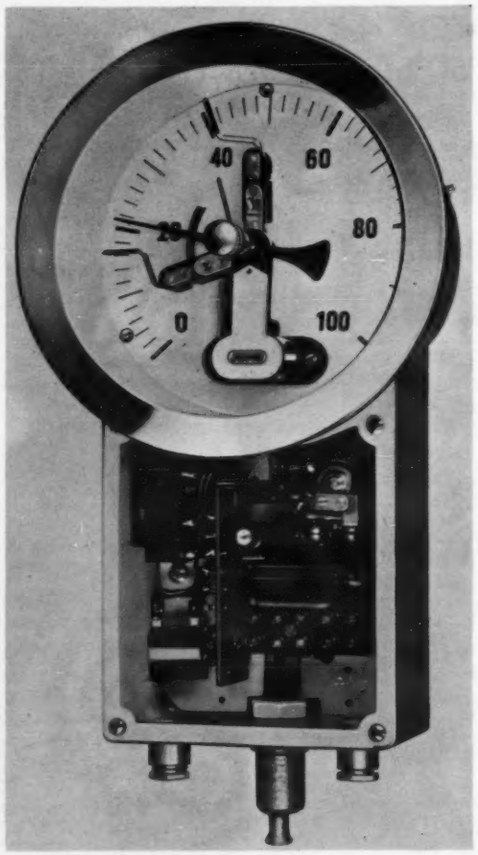
HEYCO®
Hey Man . . . Say HEYMAN!

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IDEAS IN THE NEWS

•IN A NOVEL LIGHT-CONTACT MANOMETER, an auxiliary hand with attached blocking vane is retained at the light gap, while the main hand can safely overshoot the preset range by a wide margin. Conventional instruments have the blocking vane attached to their single hand. When actual value exceeds limit greatly, vane is pulled past light gap, releasing beam and erroneously indicating a return to normal operating range.

Indicating hand has to overcome only the resistance of an elastic link connecting it to the auxiliary hand. Required force is small, making device suitable for low-torque uses such as precision pressure gages and remote thermometers. Light gap consists of a photocell and a miniaturized glow-bulb operating at 70 percent of its rated voltage. Complete contact unit is small enough not to interfere with scale reading. Light signal is amplified by transistorized relay unit, which also furnishes glow-bulb voltage. M. K. Jucheim, Fulda, Germany. R.F.S.

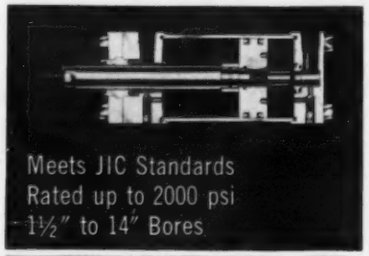


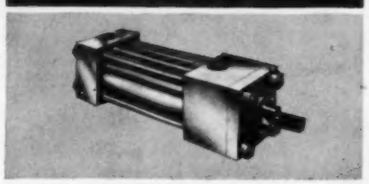
(Continued on next page)

NEW O-M SQUARE HEAD HYDRAULIC CYLINDER

now available

SERIES "L"





For years, you have looked to Ortman-Miller for the original space-saving, tie-rodless air and hydraulic cylinders. Now, with the introduction of the new Series "K" air cylinder, recently announced, and the new Series "L", hydraulic cylinder, featured above, you can look to O-M for all of your cylinder requirements.

A product of the teamwork of O-M specialists, this new Series "L" hydraulic unit reflects the research, design, engineering and production capabilities and experience that are an integral part of every O-M cylinder. The result, a quality, hydraulic cylinder designed for long service, high operational efficiency and quick, easy maintenance, dimensionally interchangeable with most cylinders of a like type.

For complete details mail coupon today for Bulletin No. 116 in which all cylinders have been dimensioned in accordance with NFPA recommendations for your convenience.



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FREE!



Revcor





FAN BLADES

8 types for all applications. Diameters ranging from 6" through 48".

BLOWER WHEELS

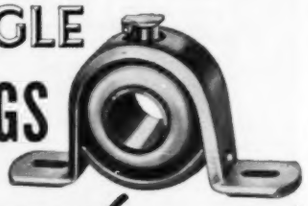
Single and double inlet. Diameters from 3-27/32" to 15". Widths 1" to 15". Housings and Inlet Rings available.

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TRIANGLE



BEARINGS with Engineered INDIVIDUALITY

Triangle fits the bearing to the application. Whether you can use a standard, like the Pillow Block above, or need a special such as the Pedestal or Clamshell Bearings shown below, your particular bearing problem receives the individual attention best assuring cost reductions — quality improvements.

SELF-ALIGNING . . . SELF-LUBRICATING SLEEVE-TYPE PILLOW BLOCKS

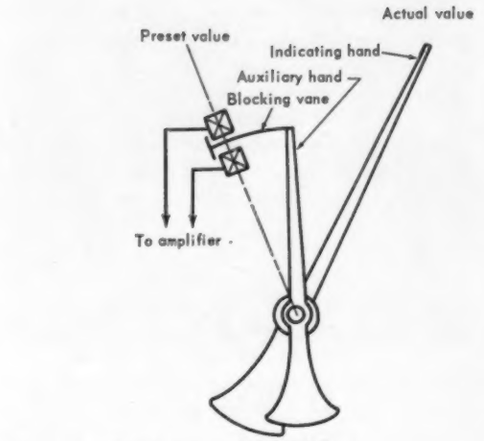


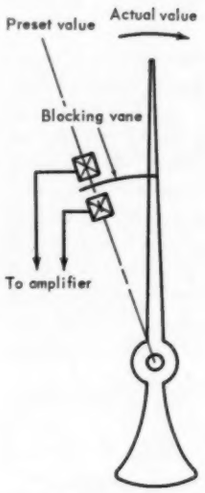
The widest selection of mountings available — functionally designed, efficiently produced. Experienced sales engineers available to help you anywhere. Phone or write for descriptive literature.



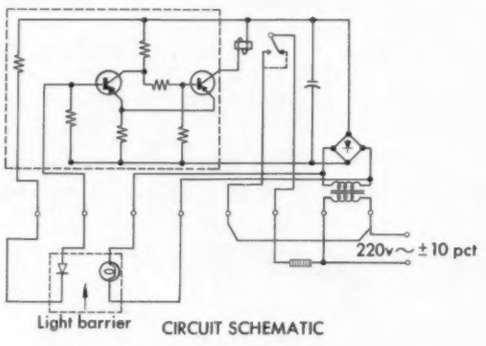
TRIANGLE MANUFACTURING CO.
732 Division St. Oshkosh, Wisconsin

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SIMPLIFIED SKETCH compares a single-hand design, new dual-hand arrangement.



NEW SMALL MAGNETIC STARTER

Costs Less, Saves Space on Low-Horsepower Jobs!



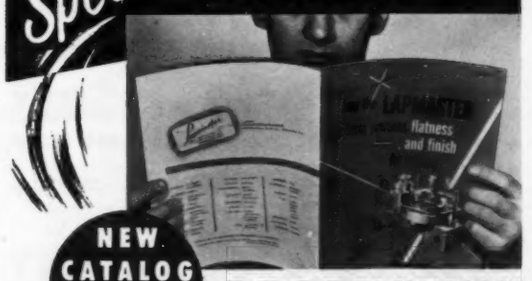
SQUARE D
NEMA SIZE 00 STARTER
RATED ¾ TO 2 HP FOR 3-PHASE SERVICE
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GET THE COMPLETE STORY!
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NEW CATALOG TELLS HOW

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CAN IMPROVE YOUR PRODUCT

Get the answers to any questions you may have about product improvement through machine lapping. You'll see why you can specify a flatness of .0000116" and a finish of 2 to 3 AA and be sure that you'll be able to produce it on a production basis with the Lapmaster. Send for your copy of the new Lapmaster catalog.

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NEEDED: EFFECTIVE VIBRATION ISOLATION AT TEMPERATURE EXTREMES

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ANSWER: MB's NEW METAL ISO-DAMP™ MOUNT

Consists of two load-carrying springs mounted in opposed position, with built-in damper to restrict resonant build up. Requires no external cooling; effective from —100 F to +500 F.



WHAT'S YOUR MOUNT PROBLEM?

This new Iso-Damp can be adapted to meet your needs—or perhaps one of MB's other standard mounts may do the trick. Let MB help you with your problem. Write for information, ask for Bulletin 418-4.

MB

MB ELECTRONICS

A DIVISION OF TEXTRON ELECTRONICS, INC.
1071 State Street, New Haven 11, Conn.

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This Revolving Joint Seals perfectly at any angle the ROTARY UNION*

The Rotary Union can be installed at any angle without putting strain on sealing surfaces. This, plus patented features which automatically compensate for machine wear and adjust to fluctuations in line pressure, make the Rotary Union the most efficient and most durable rotating joint you can buy.

There is a Rotary Union for every heating or cooling application in pipe sizes ¼" through 5". Write for Bulletin 700 today.

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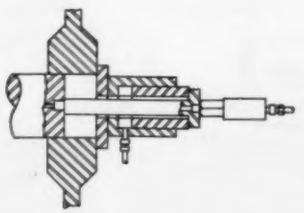
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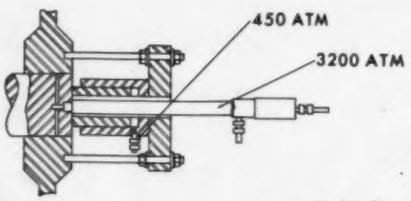
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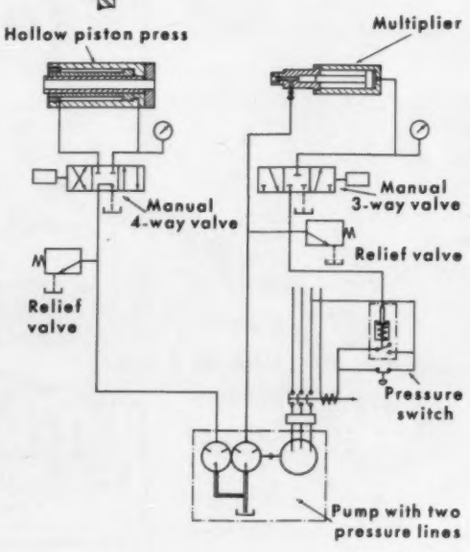
IDEAS IN THE NEWS

• **HYDRAULIC PUMP** used for drawing press-fit hubs is stopped automatically by a minimum-pressure switch as soon as hub removal is completed. Hydraulic circuit uses a pressure multiplier, a hollow piston press and a motor-driven pump with dual pressure lines.

High-pressure space of multiplier is first raised to 450 atm pump pressure, moving step piston to extreme position against slack oil. Three-way control valve then is reversed, applying pump pressure to large side of step piston and producing 3200 atm on high-pressure side. Oil enters lines in shaft, slowly applies radial pressure to hub bore. Hollow piston press now draws hub. As soon as press fit is eased, multiplier oil pressure drops abruptly and minimum-pressure switch stops pump. Frieseke & Hoepfner GmbH, Erlangen-Bruck, Germany. R.F.S.





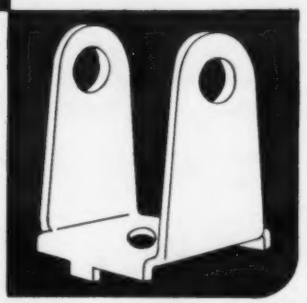




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Manufacturing Company
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⅛"—$3.00
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Ross "CUB"

CUB

NEW SPEED CONTROL VALVE

⅛" and ¼" pipe sizes in stock now!

Now a speed control valve that regulates your cylinder movement with precision and sureness, but which lists at $3.00 and $3.25. And despite its lower costs, "CUB" features the same high quality of design and workmanship you've come to expect from Ross. "CUB'S" design stresses trouble-free operation and easy maintenance. CUB is small, aluminum and lightweight. If you use speed controls, by all means call your Ross representative or write us.

Ross OPERATING VALVE CO.

106 E. Golden Gate Ave. • Detroit 3, Michigan

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If it's a pressure gauge or dial thermometer, Marsh makes it . . . and makes it better. The types, ranges and case styles are endless. What is "special" to other instrument makers is often standard to Marsh. To know the scope of Marsh instruments—











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Division of Colorado Oil and Gas Corporation

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"ZERO TO FULL SPEED IN NOTHING FLAT!"

with ZERO-MAX



STEPLESS VARIABLE SPEED DRIVE

ZERO-MAX new "400 Series" gives you stepless variable speed from zero to 1200 rpm instantly and accurately with just a finger's touch on the control lever. These compact, quality drives produce constant torque-ratings of 3 to 450 inch-pounds with fractional horsepower 1800 rpm motors. Over 250 models are available with or without safety disconnect, gearhead, reverse, or motors. Quality at LOW COST makes ZERO-MAX ideal for original equipment. *Write for free 16 page catalog.*

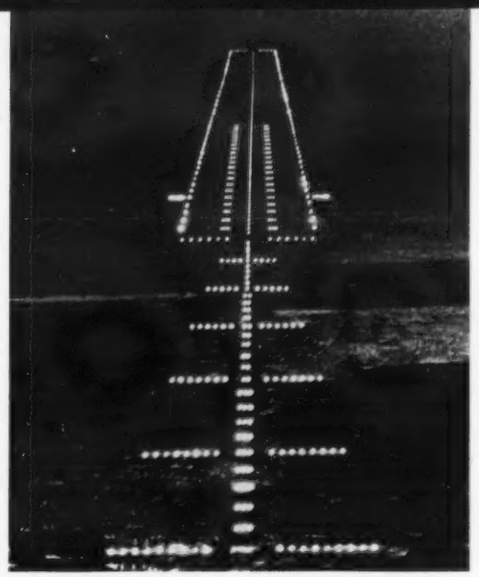
AS LOW AS $45.00

THE ZERO-MAX COMPANY

ZERO-MAX

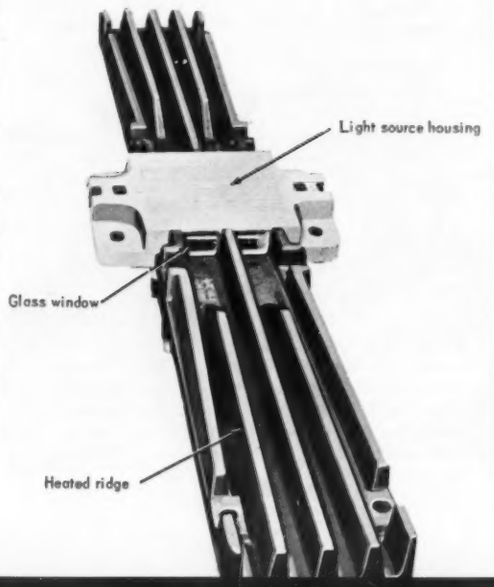
2857 Harriet Ave. So., Minneapolis 8, Minn.

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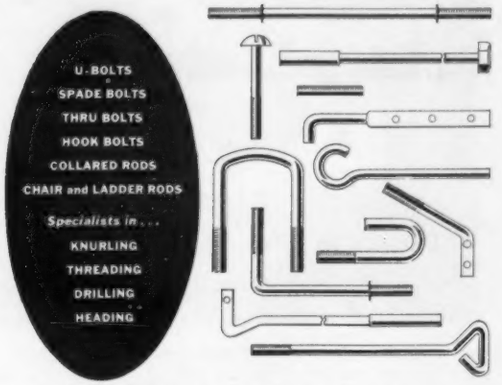


•**RUNWAY LIGHTING FIXTURE** is designed to give a unidirectional beam and to withstand peak pressures of aircraft landing gear during touchdown. The unit makes it possible to provide "narrow-gage" guide signals and a centerline flush with the runway surface. Protruding conventional fixtures either interfered with high-speed jet landings or had to be relegated to side lines, resulting in "black hole" effect for pilot after crossing the forward edge of the landing strip.

Two or four 50w lamps are mounted vertically below ground level in a waterproof housing. Their light is deflected by mirrors through a glass window. The beam, rising at a very shallow angle, passes between ridges of a separate grid. Ridges are flush with runway surface and can be heated for de-icing. Water runs off between grid and light source housing. By remote control, light intensity can be varied in five steps to fit weather and light conditions, to avoid blinding of pilot. Siemens-Schuckertwerke AG, Erlangen, Germany. R.F.S.



Complete Facilities for the manufacture of Special Headed and Threaded fasteners / from 1" to 60" in length in short or long runs



Send drawings or blueprints for quotes and literature.

OHIO ROD *PRODUCTS CO., INC.*

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If you are interested in solutions to bearing problems, you should receive TEC-TONIC regularly. With no cost, you can receive existing issues of this easy-to-read series and be placed on our mailing list to receive future editions. Specific solutions to special bearing problems such as the following are explained:

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Mount them on Scully-Jones Tychoway recirculating roller bearings. Easy to mount and preload, for load carrying and/or guiding precision machinery. Equalize starting and moving friction (coefficient of less than .005). Increase accuracy, versatility, and service life. Reduce power requirements and assembly costs. Sizes from 1000 to 32,000-lb static load capacity. Ask for Bulletin No. 22-50.

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711 Park Avenue, Sycamore 3, Illinois

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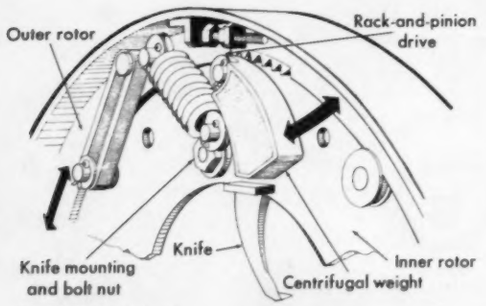
IDEAS IN THE NEWS

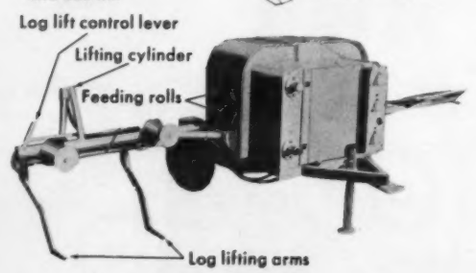
•**EIGHT ROTATING KNIVES,** in a pulpwood barking machine, are held by centrifugally controlled spring force against the wood surface. Knives strip and shred bark while riding over stubs and warpings on the log surface.

Logs are lifted hydraulically from logpile to idler rolls. Two pairs of chain-driven feeding rolls and idling guide rolls move logs through the machine.

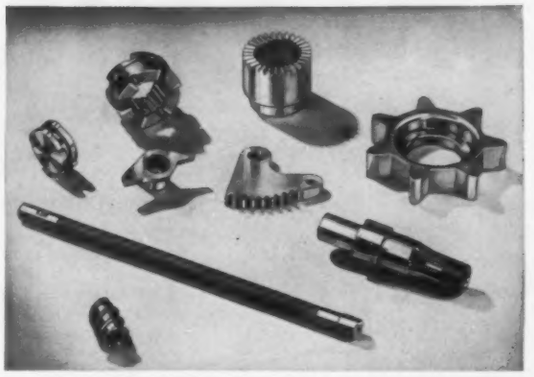
The rotor ring runs on roller bearings and is driven by a power source (usually a tractor PTO) through V-belts. Eight inward-facing knives are spaced evenly around the rotor. Each knife is supported on three ball bearings and is attached to its shaft by a retaining nut. Knife tips consist of alloy steel. The barking edge is dull to avoid undercutting. A second working edge, ground sharp, shreds the bark strips into fine chips.

The rotor handles 4-ft long (and over) logs from 2-1/2 to 14 inches in dia. Feeds range from 80 to 200 fpm. The unit requires 20 hp, weighs 3500 lb and can be pulled by truck or tractor. A larger model processes 4- to 24-inch-dia logs from 10-ft lengths upward, requires 30 hp. VK-16 and VK-26 barking machines are manufactured by Valon Kone, Lohja, Finland, and distributed by Tyovaline Oy, Helsinki. R.F.S.





CENTRIFUGAL WEIGHT is forced outward as rotor speeds up. Rotation of weight is transmitted through rack-and-pinion drive, stretches coil spring. Other end of coil spring engages short lever attached to shaft on which knife is supported. Knife is held against wood with constant force, is able to ride smoothly over surface irregularities.



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Whether you need hundreds or thousands, G.S. gives you a degree of UNIFORM accuracy *unapproached by any other Small Gear maker in the world!* That assures smooth, dependable performance and low assembly costs.

G.S. Small Gearing is mass-produced in a range of sizes from 8 to 96 dp . . . from ½" to 8" diameters, and from any Gear material. Capable G.S. engineers will gladly help you develop the ONE best and most economical design for your specific needs. Send drawings and specifications or a complete description.

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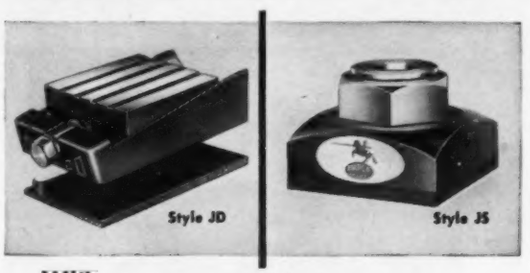
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WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS

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DEPENDABLE MACHINE SUPPORT!



With

EMPCO

LEVELING JACKS

For better machine performance set your machines level and keep them level! That's the key to increased production with less maintenance! EMPCO Leveling Jacks provide a solid, adjustable support for machine tools, large surface plates, tool room, and production equipment of all types. Easily installed and located, EMPCO Jacks keep your equipment level and stable—keep maintenance at a minimum.

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EMPCO PRODUCTS

THE ENTERPRISE MACHINE PARTS CORPORATION

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MAYLINE



WOOD PLAN FILE

Room Saving Drawer Units!

Do you need extra drawer space but are short on room? Mayline wood plan files can be readily attached to Mayline wood 4-Post tables—you get 3 extra drawer combinations at a saving of floor space.

For complete information on these and other Mayline drafting furniture and equipment write for your copy of Catalog #11, or consult your local dealer.

MAYLINE CO., INC.
529 NO. COMMERCE ST.
SHEBOYGAN, WISCONSIN



WOOD 4-POST TABLE

MAYLINE MAYLINE MAYLINE

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Designer's Fact File from DENISON

PUMPING UNITS



Vertical-type design with all components mounted as a single unit on top cover for easy access. Reservoir base with capacities from 5 to 35 gallons. Adjustable relief valve provides simple control of maximum pressure. Standard NEMA, C-base type motor. Available with optional accessories—coolers, filters, gauges and temperature gauges. Volume capacities from one to 18 gpm, pressure ranges from 800 to 3000 psi.

Write for full details in Bulletin PU-3.

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PUMPS • MOTORS • CONTROLS

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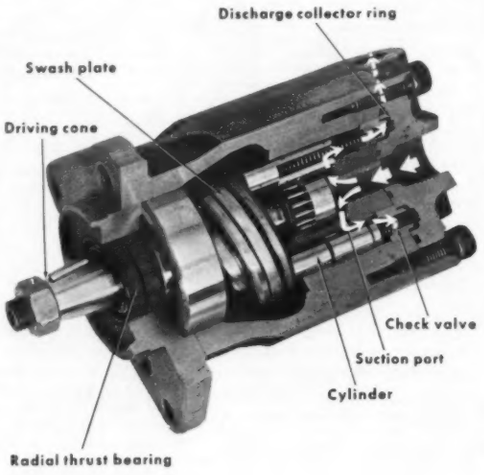
Circle 198 on Reader-Service Card for more information

• **PRESS-FIT AXIAL BALL BEARING** serves as swash plate in a new axial piston pump. The result is a design with a minimum of moving parts. Low friction combined with narrow tolerances yield a claimed average lifetime of 10,000 hours.

Drive shaft and suction duct are on a common centerline. The short shaft runs on a radial thrust bearing on the drive side and on a radial needle bearing approximately in the center of the housing. A steel disc separates suction duct from drive space and serves as axial end stop for the needle elements. Between the two shaft bearings, one-half of an axial bearing is press-fitted at an angle on the shaft, with balls facing the suction side. The other half is held in place by six spring-loaded working pistons. As the shaft turns, the press-fit bearing half produces wobbling action; the other half rotates with low friction and reciprocates the pistons.

Compression springs are seated inside the hollow pistons. Timing is automatic and simple. As each piston in turn reaches bottom dead center, its lip releases an inlet port through which fluid enters radially from the suction space. Outlets are ball-and-spring type check valves, feeding into a common annular collector duct. For precise running, piston diameters are ground to 0.0008-mm tolerances.

The pump is limited to suction pressures within −0.4 atm, + 1.0 atm of normal pressure. Maximum service discharge pressures are 150 atm at 3000 rpm, 200 atm at 1500 rpm. Delivery rates range from 0.75 to 9 gpm at 3000 rpm. SAE 5W to SAE 20 oil is specified. A 3-way valve attachment adapts pump to lifting circuits. The new pump is manufactured by Maschinenfabrik Johann Bucher, Griessen, Germany. R.F.S.



JANCO MINIATURE Rotary Selector Switches



ACTUAL SIZE SERIES 1900

All Janco switches are designed and built to exceed MIL-S-6807A. Possessing long-life with a high degree of reliability, they exceed the operational and environmental requirements of shock, vibration, altitude, and explosion. Because of their design and construction, all Janco switches are ideally suited for dry circuit and signal level switching applications.

SPECIFICATIONS

Electrical Rating: Make, break, and carry Up to 5 amps 115V AC and 28V DC resistive, and 2 amps 28V DC inductive

Contact Positions: 2 to 12 positions

Index: 30°, 36°, 45°, 60°, and 90° indexing

Decks: 1 to 16 decks (single pole)

Write today for complete detailed specifications.

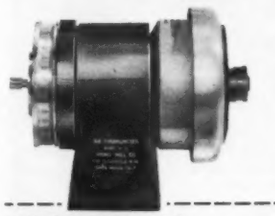
JANCO CORPORATION
3111 Winona Avenue, Burbank, California

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An Important Breakthrough in Standardized Dynamometers

HIGH SPEED AIR DYNAMOMETER

By utilizing advanced aerodynamic design principles . . . the new Air Dynamometer pioneered by Hydro-Mill operates on "the air you breathe"! This new concept has helped to expand the capabilities and efficiency of dynamometers. More important, this Air Dynamometer is priced well below conventional units. Tested and proven in laboratory and in the field, the Hydro-Mill Air Dynamometer has proven to have: (a) higher power; (b) a wide "stepless" load range (1:30); (c) higher speeds (32,000-80,000 rpm); (d) direct drive—no gearing required; (e) minimum maintenance.



Manufactured in three standard sizes, with optional sub-components for any conceivable test requirements. Completely self-contained, self-cooling and compact (5.88", 8.30" or 12.80" O.D.). Write today for prices and complete details.

HYDRO-MILL COMPANY
Santa Monica, California

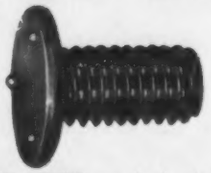
HYDRO-MILL CO.
1707 Cloverfield Blvd.
Santa Monica, Calif.

☐ Please mail 6-page Technical Bulletin on your new Air Dynamometer.

Name_____ Title_____
Firm_____
Address_____
City_____ State_____

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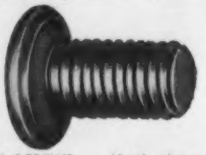
OHIO WELD SCREWS



GW SCREWS — Used where design requires a smooth unmarred surface and a fastener permanently fixed in place.



HH SCREWS — Used where a single, button-type projection is required when welding to curved surfaces, to heavy sheet 3/32" or thicker, or to ends of rods.



RW SCREWS — Used where a hermetic seal is required to prevent leakage of air, gas, water, oil or dust, or when welding to perforated metal or wires.



HW SCREWS — Used where a self-locating through bolt is required to be fixed securely in place so that it will not turn and a flush surface is required for attaching mating parts.

Thread Size #6-32 to ⅜-16
Samples and information available upon request.

The OHIO WELD FASTENERS Primary Fastener in Fastener Assemblies

THE OHIO NUT AND BOLT CO.
29 FIRST AVENUE, BEREA, OHIO

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Got an O-Ring Size* Problem?



Our "I-L-M"* technique makes it possible to provide you immediately with rings of any diameter in .139" or .275" cross section. Don't worry about quality. Note these features:

- The elastomer cord from which these rings are made is completely free of flash.
- *Uniform cross section, assured by injex lineal molding.
- Joint of same elastomer as body, no cements.
- Strong joint has 70% tensile strength of body and 65% of elongation.
- Available in Buna N and Neoprene to cover a wide range of aniline point oils.

KALENDEX DIVISION
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PERIFLEX INC.,

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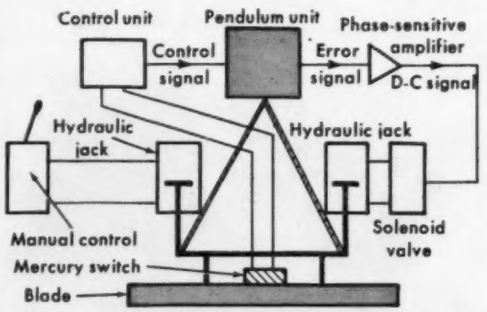
IDEAS IN THE NEWS

• HEART OF A NEW MOTOR-GRADER auto-control system is a pendulum unit (containing a compound pendulum with an equivalent length of 40 ft) mounted on the gooseneck frame that carries the cutting blade.

The blade is set to the horizontal and a mercury switch on the back of the blade is adjusted to provide a permanent horizontal datum. When setting the machine for operation, a selector switch is put to the "set" position and a set-zero control is adjusted until two indicator lights (left and right slope, respectively) are both extinguished. The blade is then horizontal. If the angle of attack is altered, the blade is set to the horizontal before demanding the new angle of cut. The control dial is then set to the required cutting angle, and a signal corresponding to this is fed to the pendulum.

The pendulum (basic vertical reference) consists of a cylindrical mass pivoted horizontally about its longitudinal axis and floating in oil in its case. It embodies a synchro that gives zero output when the pendulum's case is vertical, and the control is demanding horizontal (zero) angle, in other words, when both sets of synchro windings are in normal alignment.

The system controls the blade angle with respect to the horizontal only, depth of cut being controlled manually via a separate hydraulic jack. If depth of cut is changed, or if surface irregularities tilt the grades, the pendulum case deviates from the preset angle. The resulting error-signal causes the auto-controlled hydraulic jack to change the blade angle until the error signal is again zero, thus maintaining constant angle. The auto-control system was developed by Sperry Gyroscope Co., Ltd., in conjunction with Aveling-Barford, Ltd., London, England. R.W.E.M.



BLOCK DIAGRAM of automatic blade control system using a compound pendulum as constant vertical reference. Control signal is derived via synchros from movements of pendulum's case mounted on gooseneck frame which carries cutting blade.

(Continued on next page)

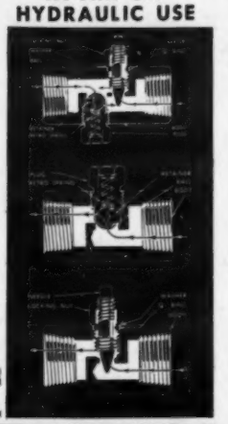
Get Easier, More Accurate Cylinder Speed Control with Pneu-Trol VALVES IN AIR OR HYDRAULIC USE

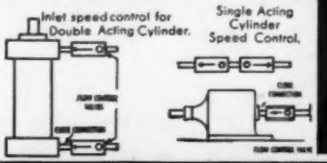


2000 and 5000 (steel) P.S.I.

Pneu-Trol Valves combine in a short, compact body, a tapered fine thread needle for extremely accurate air or oil flow control and a floating retro ball check, which permits full flow in the opposite direction. Retro ball floats in most sensitive position to seat, requiring only a slight differential pressure to fully open or close it. Check Valve and Needle Valve incorporate single function features of Flow Control Valve. All valves available in 6 female pipe sizes — ⅛" to ¾". Valve bodies are made from brass, aluminum, steel or stainless steel. Attractive Prices — Immediate Delivery.

Write for Illustrated Circular and Price List.





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BELLWOOD (Chicago Suburb) ILLINOIS

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Poly-Plates — Add new color, new beauty, new *Life* to your products with Brady self-bonding Poly-Plates. Give you unlimited freedom in nameplate design. Made of Miracle Mylar* for scratch, scuff, acid and solvent resistance. Permanent subsurface metalized printing. Sparkling gold, silver — plus all colors. No screws, rivets, heat or activators needed to apply. Stay bright, clean, legible — *for the Life of Your Product.*

*DU PONT'S REGISTERED TRADE MARK

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BACON	360
EGGS	300
FISH	380
FRENCH TOAST	360
FRUIT, GRILLED	360
HAM	360
HAMBURGERS	360
LIVER	340
MINUTE STEAK	420
PANCAKES	400
PORK CHOPS	360
POTATOES & VEG.	340
ROLLS	340
ROLLS, WARMING	260
SAUSAGE	320
SIRLOIN STEAK	420
TOASTED SANDW	360

See recipe book

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Colorful Anodized ALUMITHIN Nameplates with permanently etched printing.

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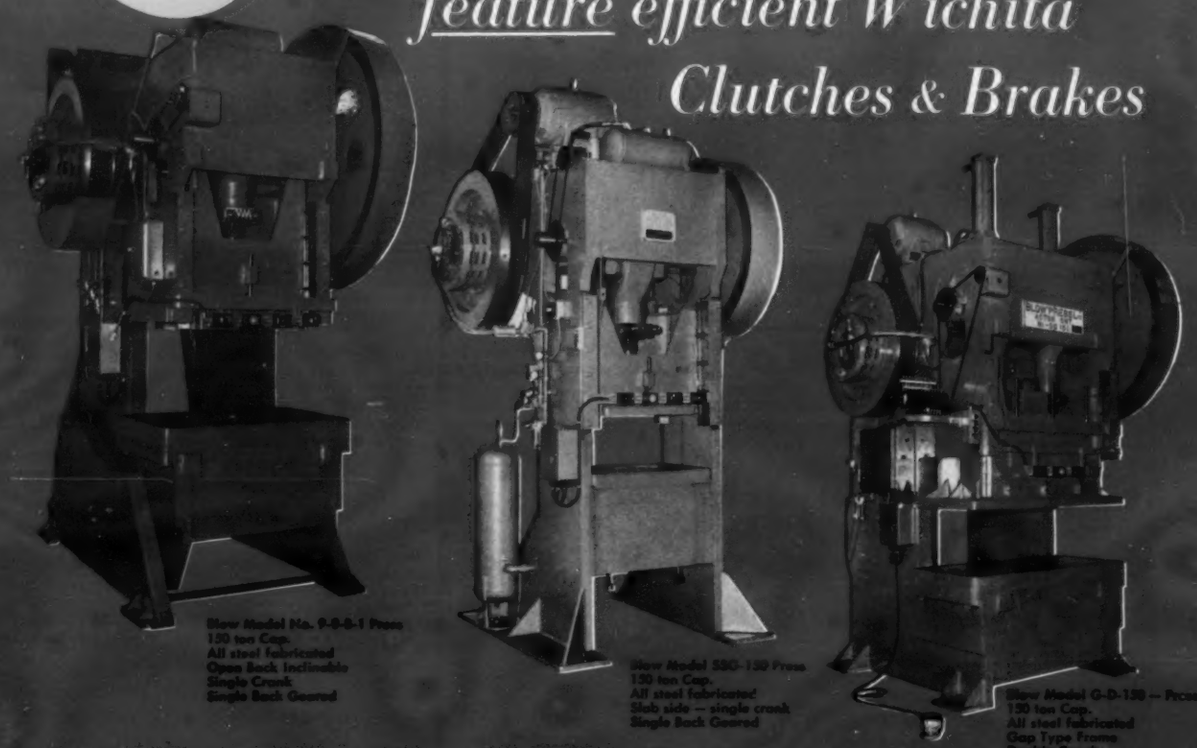
GRADER OPERATOR selects required angle of cut with control box. Control dial is calibrated in units corresponding to tangent of angle of cut and permits settings from 6-deg right-hand inclination to 6-deg left-hand inclination. Definition is claimed to be within 6 minutes of arc.

Meetings

Chicago, Ill. Oct. 9-11	NATIONAL ELECTRONICS CONFERENCE, Institute of Radio Engineers, American Institute of Electrical Engineers, et al, International Amphitheatre.
Los Angeles, Calif. Oct. 9-13	NATIONAL AERONAUTIC MEETING, Society of Automotive Engineers, The Ambassador Hotel.
New York, N.Y. Oct. 9-15	REPORT TO THE NATION AND 16th ANNUAL MEETING, American Rocket Society, New York Coliseum.
Washington, D.C. Oct. 16-19	EIGHTH ANNUAL SYMPOSIUM, American Vacuum Society, Inc.
Chicago, Ill. Oct. 17-19	JOINT LUBRICATION CONFERENCE, American Society of Lubrication Engineers and American Society of Mechanical Engineers, Morrison Hotel.

Circle 205 on Reader-Service Card

3 *New 150 Ton Blow Presses feature efficient Wichita Clutches & Brakes*



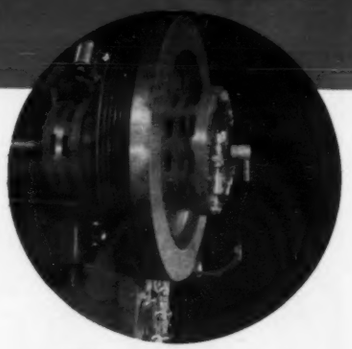
Blow Model No. 9-0-0-1 Press
150 ton Cap.
All steel fabricated
Open Back Inclinable
Single Crank
Single Back Geared

Blow Model SSO-150 Press
150 ton Cap.
All steel fabricated
Slab side — single crank
Single Back Geared

Blow Model G-D-150 — Press
150 ton Cap.
All steel fabricated
Gap Type Frame
Double Crank
Single Back Geared

K. S. Blow, President, states why Wichita has been chosen as standard on these fine Blow Presses

1. From past years' experience Wichita Clutches and Brakes have proved to operate 100% efficiently under almost any conditions, so trouble free with practically no maintenance.
2. The cost of them is reasonable.
3. No elaborate machine design, but rather simple machine design only is required to adapt them to presses.
4. Actual installation in new presses is quite simple and quick.
5. We use the standard clutch and air set brake as this combination gives us the advantage of being able to regulate the air pressure in the brake to control press stopping. The advantage here is that we can smooth out the speed of stopping of any press best suited to its particular characteristics. This combination also practically eliminates any overlap of clutch and brake action that would create "drag" on one or the other.
6. Torque characteristics of both clutch and brake are very high which allows us to use the smaller and more compact sizes and consequently more economical clutches and brakes.
7. For these reasons we quote and sell these three new model 150 ton presses equipped only with Wichita Clutches and Brakes as standard equipment.



Wichita Low Inertia Clutch and Low Inertia Air Set Brake mounted on Back Gear Shaft.

For any difficult clutching or braking problem

CONTACT YOUR NEAREST WICHITA ENGINEER

Clutch & Control Engineering Co., Livonia, Mich.
Fremont & Lewis, Inc., Cincinnati, Ohio
W. G. Kerr Company, Pittsburgh, Pa.
Clutch Engineering Co., Hartford, Conn.
Frank W. Yarline Co., Chicago, Illinois
Larry W. McDowell, Long Beach, California
Andrew T. Lobel, Denver, Colorado
Robert R. King Co., Cleveland, Ohio
Norman Williams, Houston, Texas
Sales Engineering Co., Salt Lake City 15, Utah
Allied Transmission Equipment Co., Kansas City 8, Missouri
Donald E. Harman, Dallas, Texas
C. Arthur Weaver, Richmond, Virginia
Malcolm S. Cone, Memphis, Tennessee
Dominion Power Press Equipment, Ltd. Burlington, Ontario, Canada
R. E. Kunz, Seattle 4, Wash.
Norman Rupp Co., Portland 4, Ore.
Bates Sales Co., St. Louis 1, Mo.
The Alfred Halliday Co., Lewisville, Kentucky, Atlanta, Birmingham, Knoxville, Sarasota

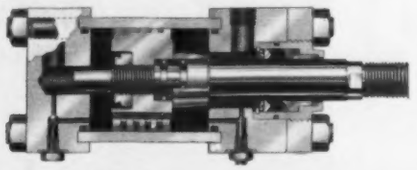
WICHITA Clutch COMPANY, INC.
WICHITA FALLS, TEXAS, U.S.A.

Write for Wichita General Catalog

EXCLUSIVE WITH CARTER!

ROD SCRAPER *PLUS* ROD WIPER AS STANDARD

J. I. C. Interchangeable SQUARELINE Series features a Metal Rod Scraper *plus* a Rod Wiper in a quick change Cartridge—*Double protection* against chips, dirt, damage. Unitized cartridge rod bearing . . . easy removal and replacement . . . no cylinder disassembly necessary!

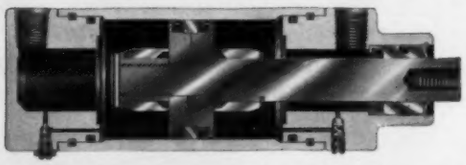


SQUARELINE AIR and 2000-3000 psi HYDRAULIC

- 1½" to 12" bore
- 100% JIC interchangeable
- True cushion-automatic concentric alignment
- Positive piston locknut design
- Delivery from stock!

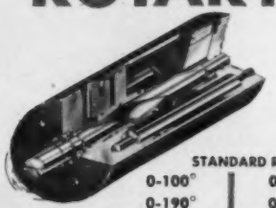
THE COMPLETE LINE
CARTER FLUID POWER

ROUNDLINE AIR-HYDRAULIC



- Space saving designs! Light weight!
- Full 1 to 1 Meehanite cartridge rod bearing.
- Precision honed heavy wall tubing—6 to 1 safety factor.
- Spring loaded "V" packing on rod end gland.
- Key type stainless steel locking ring. Allows 360° orientation of pipe parts.

ROTARY TORQUE ACTUATOR PNEUMATIC-HYDRAULIC



- New design opportunities
- To 370° rotation as standard
- Safe, powerful torque
- Air, oil, gas, water operation
- Zero leakage

STANDARD ROTATIONS
0-100° 0-280°
0-190° 0-370°

IMMEDIATE DELIVERY ON ALL STANDARD CYLINDERS AND ACTUATORS

SEND FOR MASTER CATALOG
Complete bound file. Air and hydraulic cylinders. Rotaries, clamp cylinders, air valves, and the new SQUARELINE. Complete details and prices. SEND TODAY.



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TELETYPE LNSG, ILL 1119

Circle 206 on Reader-Service Card for more information

PLANS AND CROSS-SECTIONS

Up in the Air

To extend the radar horizon so that low-flying aircraft no longer can escape early detection, an airborne radar system, carried in a helicopter tied by a cable to a ground-based generator, has been patented.

Inventor R. C. Shreckengost notes that the twin-bladed helicopter receives its power from an electric motor by means of a tethering cable. It is equipped with an autopilot capable of holding it at the desired altitude and stabilizing it against gusty winds.

The antenna is installed in the outer part of the fuselage and can scan the entire horizon. Data received are relayed to a ground station.

Another recently patented airborne device is designed for use by high-flying prospectors. The idea is to locate ore deposits by measuring the distortion of an electromagnetic field, caused by the ores, while an aerial survey is under way.

An amplifier and other detection equipment are linked to a receiving coil, mounted on one wing tip of the surveying plane, and a transmitting coil, mounted on the other wing tip. When disturbances indicating ore deposits below are recorded, the location can be marked on aerial photographs for later investigation by ground searchers.



The apparatus is a design of E. C. Snelling and P. D. Gribble, both of England.

While we are up in the air, let's note an "instructional sky scanner" which has been patented by D. T. Meisenheimer and L. W. Syarto. The hand-carried device, lighted by a battery-powered bulb, holds transparent plates depicting the location of stars and planets, so that the viewer can line up the picture with the actual constellations to learn their names while looking at them.



Wow! Have you seen the new clerk?

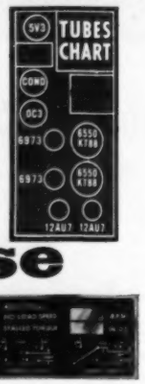
SPACE YO-YO

A Yo-yo method soon may be used to slow the spin of satellites. The mechanism consists of two end-weighted wires symmetrically wrapped around the middle of the satellite. The weights are fastened by a release device.

At a predetermined time, after the satellite has separated from the launching vehicle and is spinning in space, the weights are released and the two Yo-yo's reduce the spin of the satellite to the proper spin.

Dr. J. V. Fedor of the Goddard Space Flight Center calculated the theory and design curves of the de-spin mechanism for the National Aeronautics and Space Administration.

Label problem? heat cold gas grease





scuff shock vibration

JACOBSEN POWER LAWN TOOLS

. . . whenever any of these punishing conditions challenge the labels and insignia you design, specify rugged "Scotchcal" Film. This tough plastic material has its own tenacious adhesive—specially developed by the world's leading adhesives maker. "Scotchcal" Film goes on dry in seconds—just press in place. Wide choice of vivid colors, metallic finishes. **Send for free Design File and samples.**



- Insignia
- Labels
- Nameplates
- Instructional Panels
- Trim

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Reflective Products Division 3M COMPANY

St. Paul 6, Minnesota

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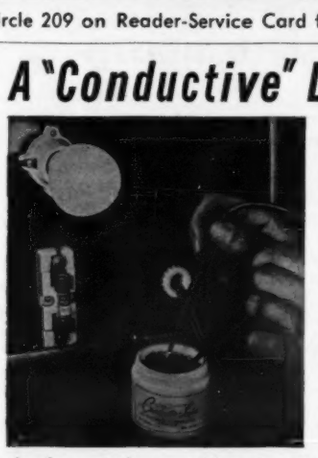


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($11.25 per 6-oz. jar if 6 or more jars ordered)

Conducto-Lube COMPANY

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Dept. DN, 8603 S.W. 17th Avenue, Portland 19, Oregon

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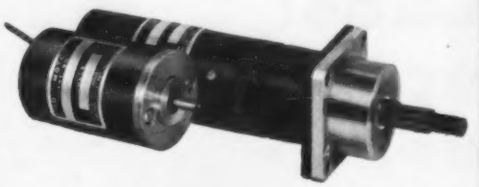
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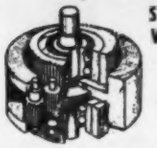
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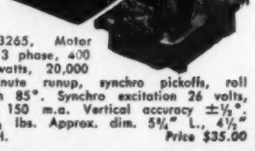
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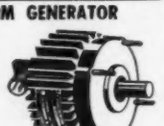
No. 146 Forward & Reverse 4-0-4. Input shaft 5/16" dia. x 3/4" long; Output shaft 15/64" dia. x 9/16" long. Control shaft 11/64" dia. x 11/16" long. Cast aluminum construction. Approx. size 4 1/2" x 4 1/2" x 4". $18.50 ea.

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GENERAL ELECTRIC AUTO PILOT DIRECTIONAL GYRO INDICATOR and CONTROL UNIT



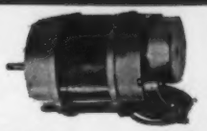
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MINNEAPOLIS-HONEYWELL RATE GYRO (Control Flight)



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BY MASTER ELECTRIC



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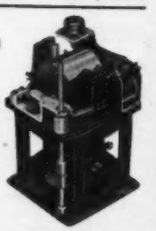


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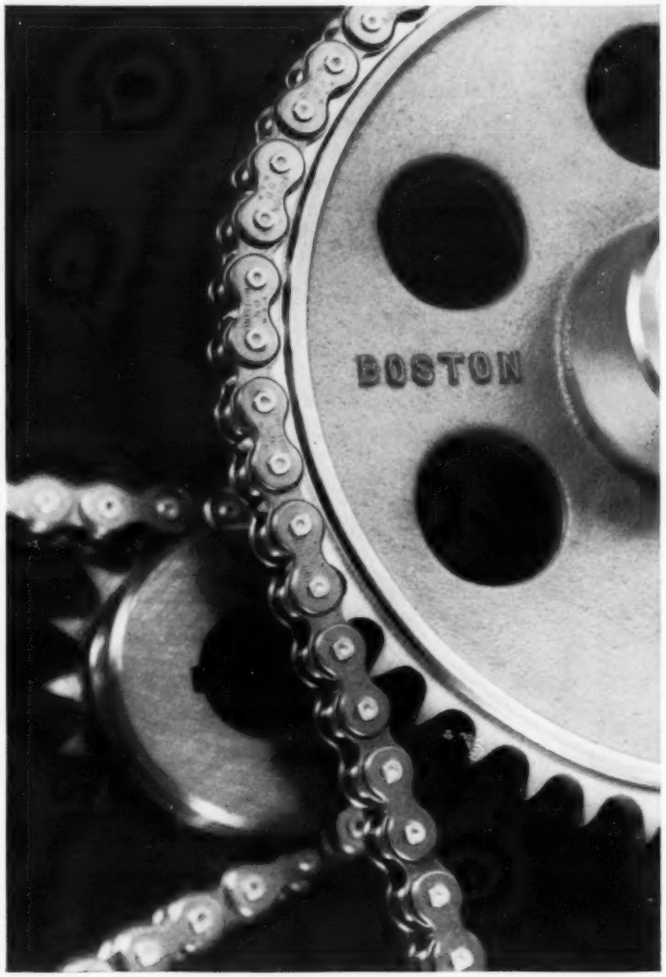
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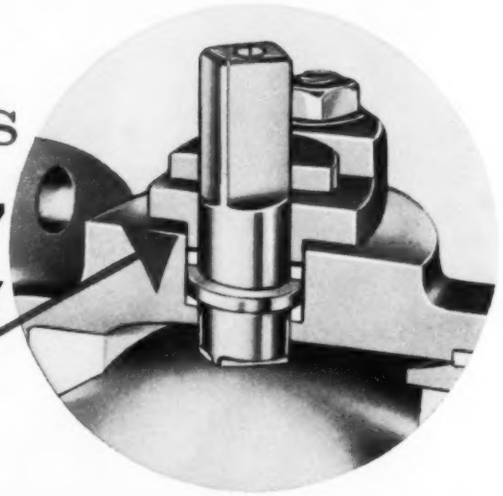
FACTS You Should Know About



jamesbury "Double-Seal"™ BALL VALVES*

*PATENTED

Due to jamesbury's unique design, the STEM ASSEMBLY is dependably leak-free



Even if you take the stem out entirely, the Jamesbury "Double-Seal" Ball Valve won't leak. That's due to the valve's superior design, which isolates the stem from the fluid stream. In fact, it is never necessary to remove the valve from the line to replace the stem seals, when this is occasionally needed.

The stem can be removed from the valve under pressure with the valve in full closed position with no leakage occurring.

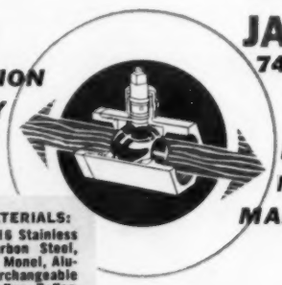
In other ways, as well, the Jamesbury "Double-Seal" Valve is outstanding. For example, there's the Jamesbury patented lip seal which maintains its tight closure despite temperature, pressure or wear. Then, too, the Jamesbury Valve is of unit body construction which means no body joints. Also, when you choose remote operators, these are mounted integral with the valve – assembled and pretested at the factory along with the valve before shipment.

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MANUAL OR POWER OPERATION

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Screwed end ¼" through 3".
Flanged 150# series ½" through 12" — 300# ½" through 8".
Larger sizes on request.

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Valves in 303 and 316 Stainless Steel, Alloy 20, Carbon Steel, Bronze, Ductile Iron, Monel, Aluminum and PVC. Interchangeable seats and seals in Teflon, Teflon compounds, Nylon, Buna-N, Neoprene, Hypalon and natural rubbers.

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